A STATE OF THE ART REVIEW ON PULSE SEEDS

Shashidhar
Assistant professor, Department of Forensic Science,
Jain (Deemed to be University), Bangalore-560027, India.
Email Id:es.shashidhar@jainuniversity.ac.in

Abstract

Nutritious and sustainable matrices with a high degree of intrinsic microstructural complexity are pulse seeds. They produce high quality protein dependent on plants and large quantities of starch and dietary fiber that are slowly digestible. Within cotyledon cells, starch and protein in pulses are located that survive cooking and subsequent mechanical disintegration, thereby maintaining the bio encapsulation of natural nutrients. In this context, a range of techniques to separate individual cotyledon cells from these seeds have been explored by several scientists, aiming to expose their digestive and physicochemical properties.Isolated pulse cotyledon cells have also been highlighted in recent years as potential novel ingredients that could enhance the nutritional properties of food products traditionally consumed. Moreover, in populations where these seeds have not historically been eaten, they could allow the implementation of a strategy for increasing pulse intake.The main focus of this analysis is on the recorded digestive, physicochemical and techno-functional properties of pulse cotyledon cells isolated by various techniques, followed by a detailed description of the nutritional properties, the structural organisations and the typical pulse seed process chain. It also provides an outlook for research directions to be taken, based on the research gaps found..

Keywords: *Foods, Human, Health, Research, Techniques, Cultivation, Agriculture.*

I. INTRODUCTION

The relationship among dietary choices, environmental sustainability, and human health is an area of increasing interest around the world. Diets with an excessive intake of refined carbohydrates, added sugars, red meats, and edible oils and a low consumption of legumes, vegetables, and fruits are significantly contributing to the upsurge in prevalence of metabolic disorders like obesity, type II diabetes, and coronary heart disease[1]. Moreover, as existing food processing activities are responsible for 19 percent to 29 percent of global greenhouse gas emissions, they place a great burden on the earth. Food matrices that have a beneficial

ISSN: 0374-8588
Volume 22 Issue 1, January 2020

impact on both human and global health are also highly recommended for current and future human diets as staple foods. Pulses are annual leguminous crops that are cultivated solely for use as dry grains, according to the Food and Agricultural Organization of the United Nations (FAO)[2]. This term excludes vegetable crops harvested in their green form for consumption (e.g. green beans and green peas), as well as vegetable crops used for seeding (clovers and alfalfa) and for oil extraction (soybeans and peanuts). All pulses, in short, are legumes, although not all legumes can be categorized as pulses. 11 types of pulses are recognized by the FAO, i.e. dry beans, dry broad beans, dry peas, chickpeas, pigeon peas, lentils, Bambara groundnuts, vetches, lupines, and minor pulses such as winged and velvet beans[3].

Table 1: Illustrates the chemical composition of diverse pulse[4]

Pulse type	Carbohydrates	Protein	Lipids	Crude fiber	Ash	Moisture
Common bean	54.3 ± 2.9	20.9 ± 1.5	2.5 ± 0.2	8.6 ± 3.3	3.8 ± 0.3	9.9 ± 0.4
Chickpea	54.0 ± 3.3	18.5 ± 1.7	6.7 ± 0.6	9.9 ± 2.1	3.2 ± 0.2	7.8 ± 0.9
Lentil	56.4 ± 4.1	20.6 ± 0.4	2.2 ± 0.1	6.8 ± 2.4	2.8 ± 0.2	11.2 ± 0.3
Pea	52.5 ± 0.0	21.9 ± 1.5	2.3 ± 0.0	10.4 ± 2.3	3.0 ± 0.0	9.9 ± 0.8

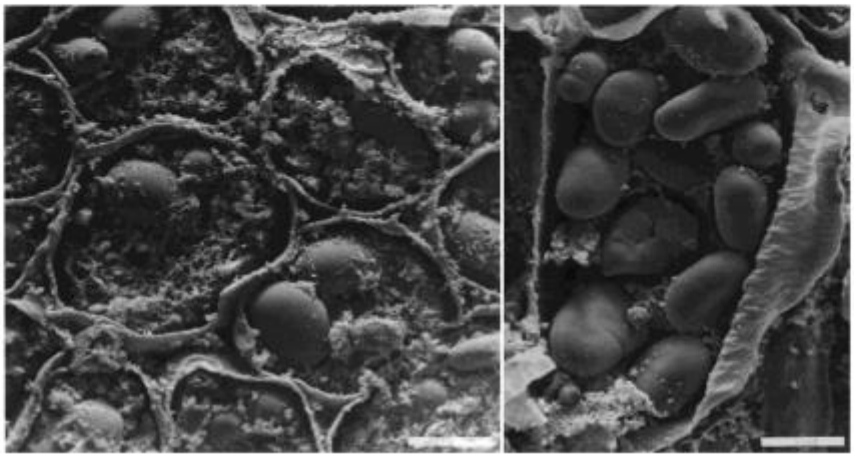

Figure 1: Illustrates the view of the cotyledon parenchyma cells of raw common beans (left) and information of the common bean cotyledon cell showing starch granules (right)[5]

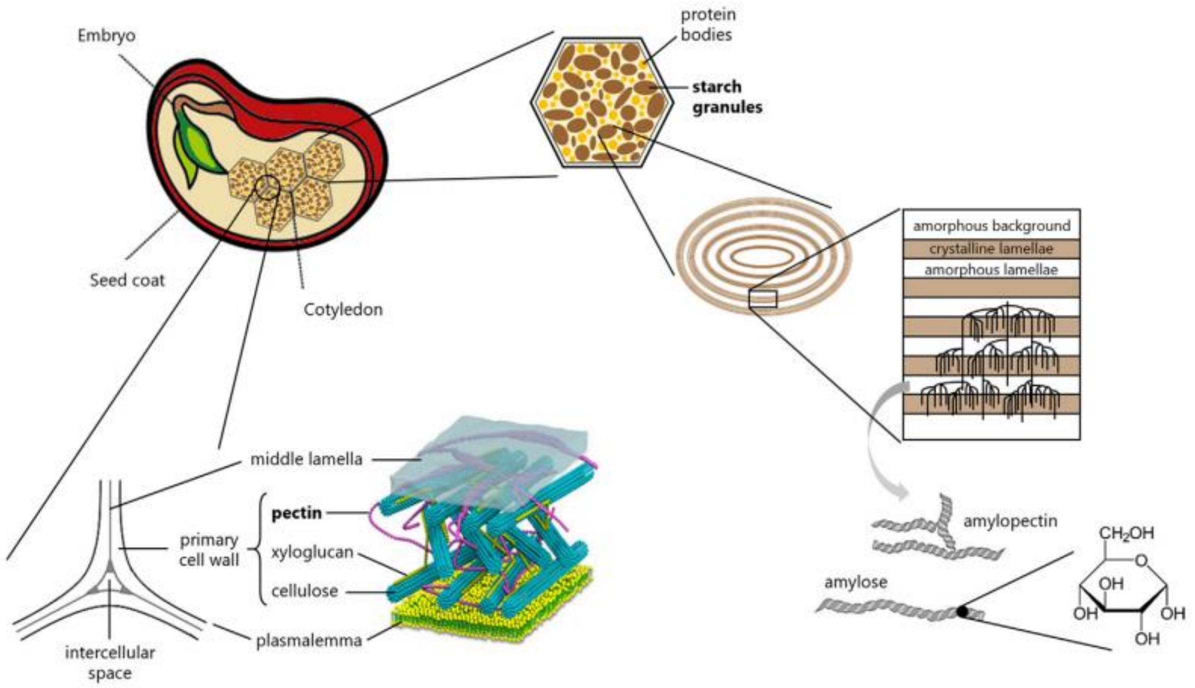

Figure 2: Illustrates the schematic representation of the diverselevels found in pulse seeds[6]

Pulses, like many other foods, are made up of a variety of compounds whose structural organization of the food matrix is determined by their assembly and interactions. This, in turn, influences the perceived sensory properties (e.g., hardness) and nutrient bioavailability obtained upon intake. The intrinsic structural organization is the major factor regulating their nutritional functionality in the case of foods that can be eaten raw, such as fruits and vegetables.This is not, however, the scenario for food matrices like pulses. Processing is a prerequisite for these seeds to guarantee adequate consumption conditions and increase digestion susceptibility[7]. The events witnessed in a subsequent digestion process will be due to a cumulative effect of intrinsic and process-induced structural attributes, since the normal structural organization of pulses will be (partially) broken and/or transformed as a consequence of processing. In addition, the influence of processing on the structure of food will depend on the conditions applied. It is therefore extremely important to consider the effect of processing (conditions) on structure[8].

II. DISCUSSION

The main focus of this analysis is on the recorded digestive, physicochemical and techno-functional properties of pulse cotyledon cells isolated by various techniques, followed by a detailed description of the nutritional properties, the structural organization and the typical pulse seed process chain. It also provides an outlook for research directions to be taken, based on the research gaps found. All in all, it is clear that the isolation by various techniques of pulse cotyledon cells constitutes a promising strategy for the production of pulse-based ingredients where natural macronutrient bioencapsulation is maintained.However, to better understand the effect of starting pulse seed material, isolation technique, and isolation conditions on the nutritional and functional properties of the finished product(s) where the isolated cells are (to be) used, much more research is needed at the level of ingredient characterization[9].

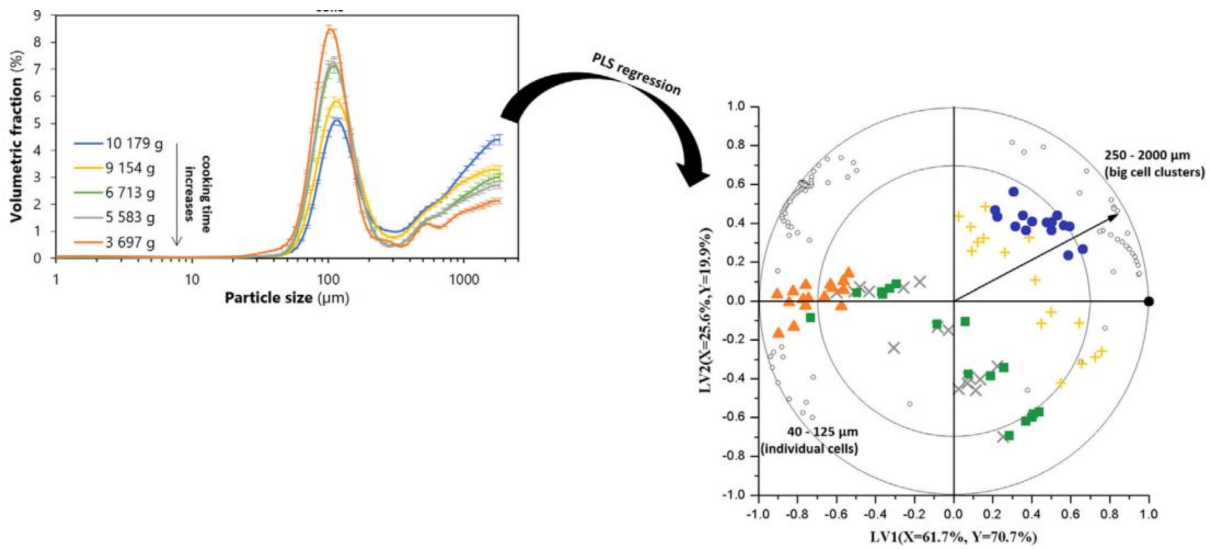

Figure 3: Depicts the particle size distribution

The daily integration of pulses into the human diet has been correlated with several health benefits. Hutchins, Winham, and Thompson (2012) presented an overview of the effect of common beans and other dry grain pulses on glycemic response and chronic disease risk in human subjects in their publication based on numerous research articles and meta-analyses. According to the scientists, robust published evidence supports the claim that pulse intake (100 to 160 g of cooked seeds per day) contributes to lower postprandial glucose levels relative to most starchy foods. In this respect, based on a meta-analysis of eight isocaloric pulse intervention studies involving 554 participants, a significant blood pressure lowering effect of dietary pulses has been identified in human subjects with and without hypertension.Table 1 illustrates the chemical composition of diverse pulse. Figure 1 illustrates the view of the cotyledon parenchyma cells of raw common beans (left) and information of the common bean cotyledon cell showing starch granules (right). Figure 2 illustrates the schematic representation of the diverse levels found in pulse seeds. Figure 3 depicts the particle size distribution.

III. CONCLUSION

Current knowledge of the isolation conditions and characteristics of pulse cotyledon cells makes it clear that complex processing conditions can be used as an engineering method for the development of novel ingredients based on pulses. Using various techniques (thermal treatment above or below the temperature of starch gelatinization, acid/alkali treatment at room temperature), the isolation of pulse cotyledon cells constitutes a promising strategy for the production of pulse-based ingredients where natural macronutrient bioencapsulation is maintained.However, in order to fully evaluate their application potential for the production of food products with specified and required (digestive) functionalities, a comparison of isolation techniques should still be made in terms of parameters such as the yield of individual cells achieved or assurance of food grade process conditions. There is no further doubt on the fundamental role played by the strong pulse cotyledon cell wall in modulating nutrient digestion in these systems, based on the findings reported by different authors. However, different isolation techniques can affect the porosity and/or permeability of the cell wall differently (and thus digestion behaviour of bio encapsulated nutrients). The intrinsic properties of pulse seeds, which could make particular pulse types or varieties exploitable for targeted applications, would in turn affect cell wall parameters.

IV. REFERENCES

[1] F. Roy, J. I. Boye, and B. K. Simpson, "Bioactive proteins and peptides in pulse crops: Pea, chickpea and lentil," Food Research International. 2010, doi: 10.1016/j.foodres.2009.09.002.

[2] S. M. Tosh and S. Yada, "Dietary fibres in pulse seeds and fractions: Characterization, functional attributes, and applications," Food Research International. 2010, doi: 10.1016/j.foodres.2009.09.005.

[3] A. K. Jukanti, P. M. Gaur, C. L. L. Gowda, and R. N. Chibbar, "Nutritional quality and health benefits of chickpea (Cicer arietinum L.): A review," Br. J. Nutr., 2012, doi: 10.1017/S0007114512000797.

[4] A. M. Goula, "Ultrasound-assisted extraction of pomegranate seed oil - Kinetic modeling," J. Food Eng., 2013, doi: 10.1016/j.jfoodeng.2012.10.009.

[5] J. A. Wood and L. J. Malcolmson, "Pulse Milling Technologies," in Pulse Foods, 2011.

[6] C. Hall, C. Hillen, and J. G. Robinson, "Composition, nutritional value, and health benefits of pulses," Cereal Chemistry. 2017, doi: 10.1094/CCHEM-03-16-0069-FI.

[7] S. Kumar, A. Gupta, and A. Arya, Triple Frequency S-Shaped Circularly Polarized Microstrip Antenna with Small Frequency-Ratio. International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)/ISSN(Online): 2320-9801, 2016.

[8] E. N. Kumar and E. S. Kumar, "A Simple and Robust EVH Algorithm for Modern Mobile Heterogeneous Networks- A MATLAB Approach," 2013.

[9] S. Kaviarasan, G. H. Naik, R. Gangabhagirathi, C. V. Anuradha, and K. I. Priyadarsini, "In vitro studies on antiradical and antioxidant activities of fenugreek (Trigonella foenum graecum) seeds," Food Chem., 2007, doi: 10.1016/j.foodchem.2006.05.064