

The impact of gastrointestinal digestion on a protein-rich soup adapted to a 65+ population: Chemical characterization and the influence of different protein sources

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Abstract:

According to the United Nations data, the proportion of older people - 65 years and over (65+) - is growing faster than any other age group. Indeed, the number of people aged 65+ worldwide is projected to more than double by 2050. These demographic changes require societal and governmental responses to adequately address ageing challenges. Some metabolic processes are compromised in older people, and sensory modalities undergo significant changes. Thus, changes in gastrointestinal function are also associated with ageing. Sarcopenia is a relevant condition in senior adults, and it is characterized by a progressive loss of muscle mass and function, reducing mobility and diminishing quality of life. Although it is a complex and multifactorial process, a deficient diet is a well-recognized factor. It is known that moderately increasing daily protein intake may enhance muscle protein anabolism and be important for reducing the progressive loss of muscle. The Diet65+ - High nutritional and functional value food products integrated with tradition and sustainability adapted to elderly 65+ consumer - is a project that intends to develop food products tailored and adapted to 65+ years individual specific nutritional requirements, respecting their food traditions.

Given the importance of high protein intake for elderly individuals, we evaluated different legume pulps as a sustainable and nutritionally rich source of protein. We have also assessed the use of legume flours (chickpea, lupin and pea flours) and protein isolates (chickpea and pea concentrates, and whey protein isolates) for developing rich protein products. The potential use of the mentioned flours and protein powder concentrates was determined by evaluating parameters such as protein digestibility, water solubility, optimal pH, water and oil holding capacity. Subsequently, six different instant soup/purée formulations (6.76 ± 0.93 g of protein/ 100 g of edible product), comprising versions with and without a vegetable protein concentrate (chickpea protein concentrate), were developed to fulfil the distinct protein needs of the elderly population. After, we assessed the impact of the gastrointestinal tract on these formulations using a static *in vitro* digestion model adapted for the older adult population (INFOGEST). We analyzed the impact of the gastrointestinal tract on protein, fat, carbohydrates and total dietary fibre content, as well as fatty acids and amino acid composition. Notably, while the gastrointestinal tract affected the nutritional composition of the tested formulations, a considerable amount of the tested molecules remained detectable after digestion. Interestingly, when comparing the versions with and without the protein concentrations, differences have arisen regarding the impact of the gastrointestinal tract on other bioactive compounds, such as fatty acids. When comparing the intestinal digestive fraction of mungo bean soup with and without a protein concentrate, we observed that the retention indexes for the major fatty acids—stearic, palmitic, and oleic acid—ranged from an average of $31.57 \pm 6.13\%$ in the standard version to $74.25 \pm 12.19\%$ in the protein concentrate version. This initial screening allowed us to select the optimal ingredients and develop products fully adapted for this population.

Keywords: Gastrointestinal digestion; High-protein foods; Elderly