Creating value to food ingredients through sustainable innovation

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Present pace of development in the area of food-processing put forward a great question: how to anticipate success for tomorrow through sustainable innovation in nutrition and health?

Sustainable way of life needs the innovation and the investments through ethical policies under well defined responsibilities of any Industry. This defines sustainable innovation in nutrition and health for food-process industries which open opportunities of production of healthier and safer chemical products and functional food ingredients (Fig 1). Such innovations must consider environment, socio-economical and ethical issues and that is possible through a good equilibrium among them. In true sense sustainable innovation in nutrition and health needs intense research which can be viable only through the association of government and consortium of industrial allies in accordance with the expert recommendations.

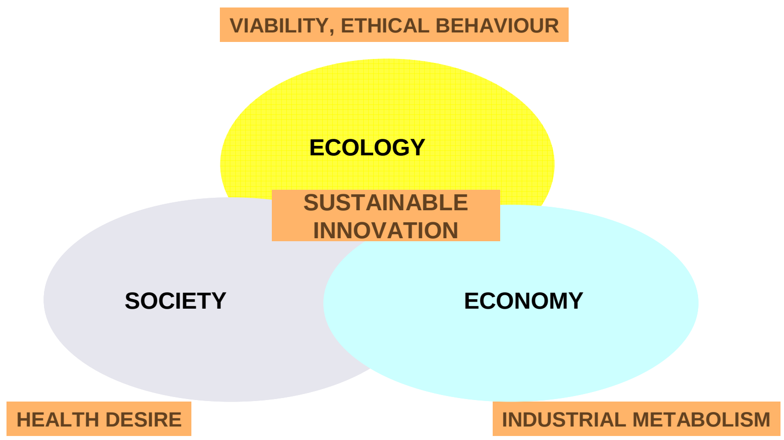

Fig. 1 : Sustainable innovation

As far as conceiving and developing functional food-ingredients are concerned one should take into account sustainable contextual components e.g. raw materials, energy, emissions, biodegradability etc. One of the objectives will be to put agriculture to serve agro-food industry which is leading not only the well-being of people but also food quality and safety. To achieve one should target the trends and needs a country, available raw materials and the bioactive products to be produced. The ultimate aim is to achieve consumers expectations which could be specific population having diseases or population willing to avoid diseases.

Research on innovative functional products is designed for preventing and reducing the risks of chronic illnesses linked to ageing and/or diets, but also for improving wellness and reducing suffering of ill people or nutritional deficient people. Sourcing of functional ingredients is mainly either from agriculture or from horticulture field. For Instance, leguminous plants such as peas, beans, lentils are cultivated for food and animal feed from long time. Those plants do not require much fertilizers and water for irrigation. Even they are useful for nitrogen fixation for soil fertility. Among them pulses are exploited primarily for their rich protein content and distinctive starch content.

Recent industrial exploitation from pea for proteins, starch and micro-constituents has shown the way of their extraction without the use of any chemical solvent. The products from pea source are at low risk of contamination (e.g. mycotoxines, pesticides) and not identified as major allergens. Moreover, pea contains functional constituents such as fibers, high biological value protein functional oligosaccharides and high amylose starch. Furthermore at the time being the biodiversity of leguminous plants is not really exploited in agro-food industry, if this could be done, probably it could be a source of innovation.

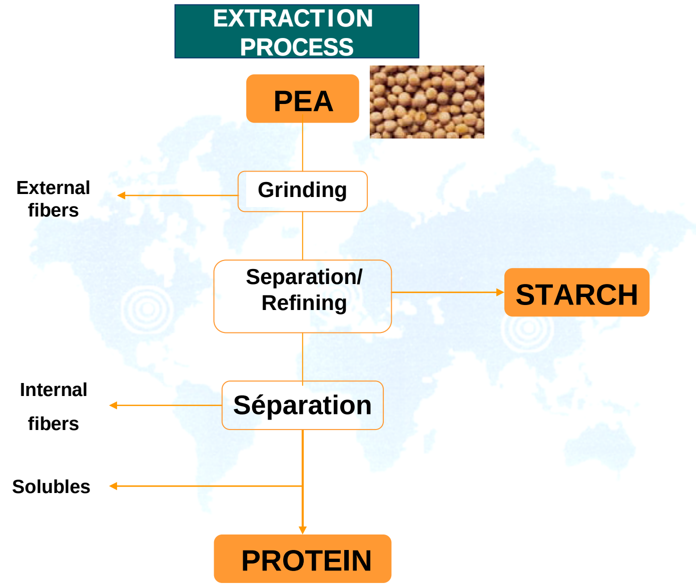

Fig. 2 : Pea extraction separation process

Presently peas as such are consumed in spite of having some drawbacks such as strong taste, anti-nutritional factors in some variety and problems in gut intolerance due to non digestible oligosaccharides and amylase inhibitors. These facts must be extracted from the pea components for their higher value for nutrition.

The leguminous industry through extraction process without use of solvent as it is the case in soy extraction industry, is able to manage concentration of micronutrients, to extract starch with new specificities such high amylose starch, to extract and design high pure fiber, to extract and produce functional pea protein, this last showing a very high biological value (Fig 2 and Fig 3).

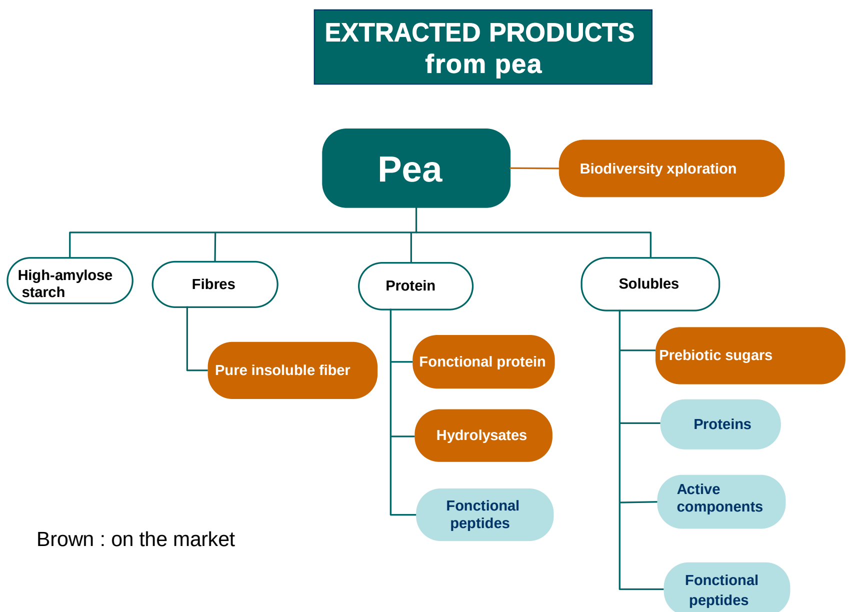

Fig. 3 : Extracted produced from pea

The amino acid profile of pea protein is interesting for its nutritional aspects. The essential amino acid profile (Fig. 4) shows that, contrary to proteins from vegetable origin generally unbalanced on this amino acid criteria, pea protein shows interesting lysine content (7.2 %), branch-chain amino acids content (17.9 %), arginin content (8.7 %)*.

In g per 100 g potein	NUTRALYS® Pea Protein	FAO 1985 Adult Reference	FAO 1985 2-5 years children
Cystine + Méthionine	2.1	> 1.7	< 2.5
Histidine	2.5	> 1.6	> 1.9
Isoleucine	4.5	> 1.3	> 2.8
Leucine	8.4	> 1.9	> 6.6
Lysine	7.2	> 1.6	> 5.8
Phenylalanine + Tyrosine	9.3	> 1.9	> 6.3
Threonine	3.9	> 0.9	> 3.4
Tryptophan	1.0	> 0.5	< 1.1
Valine	5.0	> 1.3	> 3.5

Fig. 4 : Essential amino acid profile*

Combining cereals and pea protein shows that it is possible to reach a high balanced nutritional quality. Cereals such as wheat are deficient in lysine and rich in sulphur amino acids, whereas pea are the reverse: rich lysine and low sulphur amino acids. It opens the way to launch foodstuffs well-balanced in proteins, respecting nutritional recommendations of experts and meeting consumer's safety, quality demand and taste expectations.

It is possible starting from high quality extracted pea protein to proceed to hydrolysis to obtain proteolysates, the best could be to obtain functional peptides. It is known that some peptides could be active as anti-hypertensive or antipathogen. This could be a great field of investigation for these types of products. Before reaching this ultimate goal, pea hydrolysates and pea protein can be useful for enriched protein recipes (Fig. 5). On the other hand purified insoluble fibers issued from pea can be introduced in many recipes to decrease the lipid level and to enrich the final product in fiber, thus the final product will present a low caloric level. Other fractions such as solubles obtained through the separation process (Fig. 3) presents very interesting micro-constituants such as bifidogenic oligosaccharides, vitamins and peptides. Extraction applied to leguminous through clean process allows to consider that the nutritional value of pea can be enhanced compared to raw unprocessed pea.

Dehydrated Soup
"MUSHROOMS CREAM SOUP"

For 100g	Actual	Proposal
Nutritional value (g)		
Proteins	**2,3**	**4,1**
Carbohydrates	**11,8**	**11,5**
Lipids	**8,3**	**8,1**
Caloric value (kcal)		
Proteins	**9,2**	**16,5**
Carbohydrates	**47,2**	**46,2**
Lipids	**74,7**	**73,1**
Total	**131,1**	**135,8**
% of global caloric value		
Proteins	**7,0**	**12,1**
Carbohydrates	**36,0**	**34,0**
P/L	**0,28**	**0,51**

Adding 2.2 g of Pea protein NUTRALYS would allow to claim « source of proteins »

Fig. 5: Recipe with pea protein

Conclusions

The ultimate goal for nutrition and health in a sustainable way is favoring decreasing risks of chronic diseases related to food (deficiencies and excess) and aging, helping specific populations to better support disease treatment and improve well-being while decreasing pain. Thus sustainable products and functionalities require food industry's innovations and investments to be in adequation with ethical policies, environmental protection, nutritional expert recommendations, specific needs of populations and individuals, economical and safe food processes. The example of extraction leguminous industry illustrates a way of sustainable innovation in nutrition and health.

* NUTRALYS® pea protein available on the market.

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