

High value co-products from plant foods: cosmetics and pharmaceuticals

- Plant extract have been widely used as topical applications for wound-healing, anti-ageing and disease treatments.
- Examples of these include ginkgo biloba, echinacea, ginseng, grape seed, green tea, lemon, lavender, rosemary, thuja, soy, jojoba, aloe vera, papaya and many others.
- There are many plant-derived compounds that have the potential to be used in the pharmaceutical and cosmetic fields but three important groups are
 - Plant-derived polysaccharides
 - Phenolic compounds
 - Plant-derived oils

Plant-derived polysaccharides

- Many polysaccharides of plant origin are responsible for their bioactive properties.
- A wide range of bioactivities has been identified including anti-tumour activity, anti-viral activity, anti-bacterial activity, anti-complementary activity, anti-coagulatory activity, phagocytotic activity, anti-thrombotic activity, anti-ulcer activity and wound healing properties.
- In cosmetics, product containing plant polysaccharides are capable of relieving dryness and provide a soothing membrane that covers the human skin.

Phenolic compounds: natural antioxidants

- Antioxidants are of interest to the food industry because they prevent rancidity.
- However, they are also of interest to biologists, biochemists and clinicians, because they may help to protect the human body against damage by reactive oxygen species.
- A broad definition of an antioxidant is “any substance that, when present at low concentrations compared with those of an oxidisable substrate significantly delay or prevent oxidation of that substrate”.
- The term “oxidisable substrate” includes almost everything found in foods and in living tissues including proteins, lipids, carbohydrates and DNA.
- Phenolic compounds are the largest group of plant antioxidants and they also act against the oxidation of high-density lipoproteins. In this way, they help the body retain important HDLs while helping it get rid of problematic low-density lipoproteins.
- In addition, plant phenolics have also been found to have anti-ulcer, anti-carcinogenic and anti-mutagenic activities due to its strong antioxidant power, since they are able to scavenge free radicals.

Plant derived oils

- All plants contain oil or fats mainly in their seeds, mostly in the form of triglycerides.
- Triglycerides from vegetable oils can be considered as important raw and renewable materials for the preparation of products useful for foods, pharmaceuticals and cosmetics.

Key reason for exploiting plant-derived compounds from co-products

1. Recovery of by-products from the food and food-processing industries: environmental benefits

- The food and food-processing industry produces considerable amounts of waste, residues, effluents and by-products which contain important amounts of potentially interesting compounds.
- The disposal of these residues often creates an enormous environmental problem. Thus, a number of by-products and/or co-products of agricultural business are presently returned to the land as fertilizer or solid modifiers, fed to animals or fish as nutrients, burnt for energy or applied to value added conversions.
- The finding of alternative uses for these natural residues, for instance in non-food areas such as pharmaceuticals and cosmetics with a high value added, might help to alleviate this situation.

2. Preference for natural products versus synthetic compounds: driving force for food, cosmetics and pharmacological fields

- Until now, most attention has been paid to oral administration of natural radical scavengers as food supplements. However, protection from hazardous species is not only of nutritional relevance. Neither are oxidation reactions an exclusive concern of the food industry.
- In fact, the customer's awareness of 'non-chemical' ingredients in health products has also to be faced by the cosmetic and pharmaceutical industry.
- These three sectors are drawn together promoting products named functional foods, food supplements, nutraceuticals and/or cosmeceuticals.

3. Economic aspects of the recovery of highly valued compounds

- The development of new co-products derived from inherently low-value raw materials might be economically beneficial for the agro-food industry.
- However, many different problems need to be overcome in order to assure the success of these novel products in the market. For example, the industry needs to convince investors in the production of plant-based cosmetics and pharmaceuticals.

4. Biotechnological advances in the extraction processes

- Currently, many extraction procedures for plant phytochemicals involve the use of organic solvents. With increasingly restrictive legislation, it is imperative that safe and efficient extraction processes are developed that guarantee an appropriately pure plant extract or plant derived compound.
- Therefore, the utilization of relatively new and safe extraction techniques such as supercritical fluid extraction might help to solve this problem.
- Furthermore, the advantages of using CO₂ as the extraction agent being low cost, non-toxic, non-flammable and non-corrosive make it the perfect solvent for different natural products such as phenolics and vegetable oils.