

Exploring sustainable membrane strategies for producing concentrated juice enriched of health-promoting compounds from red fruits

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Red fruits are among the most important dietary source of polyphenols, such as anthocyanins, flavonols, benzoic and hydroxycinnamic acid derivatives. Numerous *in vitro* studies have reported that their ingestion is helpful in fighting different pathologies, such as cancer, heart disease, and type 2 diabetes. Given the wide spectrum of healthy activities of these fruits, the interest of researchers has been addressed, in recent years, towards new methods able of producing juices enriched in bioactive compounds with a high organoleptic profile. In this contest, membrane processes represent a very powerful alternative, to conventional technologies, reducing the heat-associated loss of nutritional and functional quality due to the moderate operating temperatures used in the process.

In this work, sustainable processes based on the combination of conventional and innovative membrane techniques including ultrafiltration (UF), nanofiltration (NF) and osmotic distillation (OD), in a sequential design, were studied for the production of concentrated juices with a high nutritional profile and improved antioxidant capacity, from two selected red fruit juices: pomegranate and a blend of pomegranate, cactus pear juice and red orange juices. Specifically, red juices were at first pre-treated by UF for the removal of suspended solids and then concentrated through a combination of NF and OD or submitted to a fractionation/concentration process by NF in order to produce concentrated fractions enriched in polyphenols and depleted in sugars. The investigated processes allowed to obtain three valuable products: *i*) a concentrated blend of red fruit juices (OD retentate at 60°Brix), with high antioxidant potential and enriched in health compounds of interest for the production of functional foods; *ii*) a concentrated pomegranate juice (NF retentate), enriched in anthocyanins that can be reused for the formulation of nutraceutical products or as natural colorant; *iii*) a NF permeate fraction enriched in sugar compounds can be reused as food additives or as bases for soft drinks.

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