Sustainable food processing requires dry fractionation and more efficient drying

SCHUTYSER M. (1)
1 Wageningen University, Wageningen, Netherlands

Energy and food prices are soaring due to the war in Ukraine. Climate changes accelerate and lead to periods of draught and flooding dramatically affecting the harvest of crops. Food security for large part of the global population is at stake. We need to intensify our efforts to come up with creative solutions to feed the world. In this contribution I will discuss that traditional wet processing technologies for making food ingredients consume enormous amounts of water and energy and that these can be replaced by making use of dry fractionation. For many biological materials the combination of milling and dry separation such as air classification or electrostatic separation can be used to prepare enriched ingredient fractions with interesting functional properties. We study the properties and disclosure of biomass and use this insight to design combinations of milling and dry separation techniques such as air classification and electrostatic separation to effectively make ingredient fractions that are enriched. We discovered that the protein-enriched fractions obtained have high fibre and micronutrient levels and retained native functionality, which is interesting for many food applications and fits into a healthy diet. However, drawback of dry fractionation is that purity is limited. In that case a hybrid approach is suggested in which part of the ingredients are further processed by wet processing. Wet processes usually require a spray drying step to obtain shelf-life stable and functional ingredients. We calculated that by optimizing spray drying operations in terms of energy consumption and material losses, we can save about 38-76% of the amount of energy spent during drying. Therefore, we deepen our understanding on behavior of concentrated biological materials to make this process extremely more efficient. We do this by mimicking the spray drying process at the smallest relevant scale, i.e. the single droplet and combine that with modelling and pilot-scale testing. Next to these efforts, we recently started a large project on the use of electric driving forces to accelerate dewatering and drying during food production. With this, we ultimately aim at processing of our foods with minimal energy input while fueled by renewable energy.