

  
**CONGRESS  
2021**

Welcome to SAAFoST's  
24th Biennial International  
Virtual Congress

20 - 22 September 2021



## Microwave and Radio Frequency Drying of Fruit and Vegetables

Trond Løvdal, Dagbjørn Skipnes, Torstein Skåra

Nofima, Stavanger, Norway

### Abstract

Drying is one of the oldest food preservation techniques. It removes the water from fruits and vegetables, and drastically reduces water activity, thus improving food safety and reducing food waste by extending shelf life. Solar drying is commonly used in rural environments by small scale farmers, but albeit cheap, can be difficult to control and normally produces dried products with reduced nutritional value, as compared to drying in convection ovens which are used at commercial level. An additional disadvantage is loss of produce due to unfortunate weather conditions or attacks by insects or animals. Energy usage, drying time and quality of the dried products are important factors to be considered for improving energy intensive technologies which can have higher carbon footprint that are not advisable to achieve current climate action goals. Current conventional systems, where hot air has been used as drying medium, are energy intensive with longer processing times.

The energy consumption of drying has been reported to account for 12–20% of the energy used by food processing industry every year. Innovations in drying technologies have indicated significant reduction in energy use in food processing. Microwave (MW) and Radio Frequency (RF) drying, often combined with hot air drying or other technologies (e.g., Infra-Red (IR)) have been reported to substantially reduce energy consumption and drying times. Promising results have also been obtained for drying combined with pre-treatment processes like pulsed electric fields (PEF) and ultrasound, as novel drying strategies for fruits, vegetables, and root crops, in comparison to conventional ones in terms energy usage, the nutritional and functional quality as well as usage of dried products. However, these novel technologies are not yet widely implemented in the food industry and knowledge and experience is required to set up optimal processing conditions. Here, we review and discuss the use of novel food drying technologies MW and RF in combination with PEF pre-treatment and hot air drying, in comparison to alternative traditional and novel methods, with respect to industrial up-scaling, sustainability (economic, environmental, and social), energy use, and nutritional and sensorial quality of the end products.

### Biography: Dr Trond Løvdal

Dr. Scient. Trond Løvdal (male) is a researcher and project leader at Nofima, Department of Processing Technology, since 2009. He obtained his PhD in Microbiology in 2007 from the University of Bergen. He then worked two years as a post-Doctoral fellow at the University of Stavanger, Centre for Organelle Research. Dr. Løvdal has special competence in general microbiology, molecular microbiology, and food safety and hygiene. He has also coordinated and participated as WP-leader in several national and

international research projects spanning from sustainable vegetable food production, development of novel industrial food processing technologies, Design for Cleaning, validation of novel food processing cleaning systems, development of molecular methods for pathogen detection, etc. Dr. Løvdal has published 30 papers in international peer-reviewed journals, receiving >1400 citations, and contributed to 38 international peer-reviewed conference publications.