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PARAG PRAKASH SUTAR

OBJECTIVE

To generate knowledge in the field of food engineering and disseminate it for welfare of society.

RESEARCH ACTIVITIES

Dr. Parag Prakash Sutar is working on heating and drying of agricultural, food and marine products. He has developed advanced food processing techniques, equipment for industry and published papers in the peer-reviewed international/national journals.

EXPERIENCE

NATIONAL INSTITUTE OF TECHNOLOGY ROURKELA (ODISHA)

Assistant Professor, FEB 2014- till date

ANAND AGRICULTURAL UNIVERSITY (GUJARAT)

Assistant Professor, FEB 2009- FEB 2014

INSTITUTE OF CHEMICAL TECHNOLOGY, MUMBAI (MAHARSHTRA)

Post-Doctoral Fellow, APRIL 2008-FEB 2009

EDUCATION

PhD (Agricultural and Food Engineering), Indian Institute of Technology Kharagpur, India

M. Tech (Process and Food Engineering), G.B. Pant University of Agriculture & Technology, Pantnagar, India

B. Tech (Agricultural Engineering), Dr. PDKV, AKOLA, Maharshtra, india

PUBLICATIONS

Total – 47(Articles, book chapters, Conference publications)

(https://scholar.google.co.in/citations?user=9H6bktQAAAAJ&hl=en)

PROJECTS

SPONSORED AND INDUSTRIAL CONSULTANCY

1. Microwave Processing of Foods, Sponsored by Twin Engineers, Vadodara, India (2014-15)

2. Development of Microwave Sterilizer for Spices, Sponsored by NIT Rourkela, Seed Money Project (2014-15)

3. Development of Cost Effective Microwave-Infrared-UV Assisted Continuous Sterilization Process for Spices, Sponsored by Ministry of Food Processing Industries, Govt of India (2015-18)

SHORT COURSE CONDUCTED

Global Initiative on Academic Network (GIAN) sponsored one week course in December 2017 on Innovative Food Processing and Packaging Technologies.

Faculty: Dr. Shyam sablani, WSU, US and Dr. P P Sutar, NIT Rourkela

INDUSTRIAL TRAININGS DELIVERED

1. Thermal Sterilization Technologies for Foods, Hotel GRT Radisson Chennai (Dec 10-11, 2010), Le Royal Meridian Hotel, Mumbai (Dec 13-14, 2010)
2. Advanced Dehydration Technologies for Foods, Vadodara and Anand (Dec 2011)
3. Food Preservation and Thermal Processing Techniques, ITC RTE Division Bangalore. Dec 9-10, 2011

· Total number of industry personnel trained : 60+

· Participants' Countries: India, Srilanka

·Participants' Companies: ITC Foods Ltd. Bangalore, Mother dairy, Mahananda dairy, Hamdard Laboratory, Kraft foods and many other canning and dehydration industries.

(Faculty: Dr. Shyam sablani, WSU, US and Dr. P P Sutar, NIT Rourkela)

STUDENTS

POST GRADUATE SUPERVISION:

MTECH (FOOD PROCESSING TECHNOLOGY/FOOD PROCESS ENGINEERING)

1. Deepika S. (2017) Infrared and Microwave Assisted Hot Air Drying of Lemon (*Citrus limon* L.).
2. Patel J H (2011) Hybrid (Osmotic and Microwave Vacuum) Drying of Elephant Foot Yam.
3. Patel D N (2010) Development of fermented cereal - legume based instant food (*Dhokla*) using microwave radiation.

ONGOING: 05 PhD (FOOD PROCESS ENGINEERING)

1. Microwave Sterilization of Spices, Shivanand Shirkole, PhD ongoing
2. Microwave Infrared Assisted Continuous Processing of Paddy, Gitanjali Behra, PhD ongoing
3. Sterilization of Spices, Om Suryawanshi, PhD ongoing
4. Microwave Processing of Foods, Sudarshanna Kar, PhD ongoing
5. MW-IR-UV sterilization of foods, S Deepika, PhD ongoing

TRAINEES FROM OTHER INSTITUTE:

1. Dr. A.E. Kate, Scientist, Agro Produce Processing Division, ICAR- Central Institute of Agricultural Engineering, Bhopal
2. Mr. Shubham Aditya, BTech student, Tezpur University

MOST RECENT PUBLICATIONS

Behera, G., and Sutar, P. P. (2018). A comprehensive review of mathematical modeling of paddy parboiling and drying: Effects of modern techniques on process kinetics and rice quality. Trends in Food Science & Technology, 10.1016/j.tifs.2018.03.015

Behera G. and Sutar P. P. (2018) Development of a New Pre-Drying Method of Accelerated Water Absorption and Partial Gelatinisation of Starch in Paddy using Pulsed Microwave-Water Applications in a Microwave Rotary Drum Dryer, Drying Technology, Accepted Manuscript, 10.1080/07373937.2018.1456450

Shirkole S.S. and P. P. Sutar (2018) High Power Short Time Microwave Finish Drying of Paprika (Capsicum Annuum L.): Development of Models for Moisture Diffusion and Color Degradation, Drying Technology, Accepted Manuscript, 10.1080/07373937.2018.1454941

Deepika S. and P.P. Sutar (2018) Combining Osmotic-Steam Blanching with Infrared-Microwave-Hot Air Drying: Production of Dried Lemon (*Citrus limon* L.) Slices and Enzyme Inactivation. Drying Technology, DOI:10.1080/07373937.2017.1422744

Shirkole, S. S., & Sutar, P. P. (2018). Modeling Sorption Phenomena and Moisture Migration Rates in Paprika (Capsicum Annuum L.) using Physicochemical Characteristics. Journal of Food Science and Technology, 55(2), 678-688, 10.1007/s13197-017-2977-x

Behera, G., Sutar, P. P., & Aditya, S. (2017). Development of Novel High Power-Short Time (HPST) Microwave Assisted Commercial Decontamination Process for Dried Turmeric Powder (Curcuma Longa L.), Journal of Food Science and Technology, 54(12), 4078-4091.

Patel J.H. and P.P. Sutar (2016) Acceleration of Mass Transfer Rates in Osmotic Dehydration of Elephant Foot Yam (Amorphophallus paeoniifolius) applying Pulsed- Microwave-Vacuum. Innovative Food Science and Emerging Technologies, 36, (August), 201 -211

Deepika S. and P.P. Sutar (2016) Osmotic Dehydration of Lemon (*Citrus limon* L.) Slices: Modelling Mass Transfer Kinetics Correlated with Dry Matter Holding Capacity and Juice Sacs Losses, Drying Technology, 35 (7), 877-892

INVITED SPEAKER

Design of Electromagnetic Energy Based Machines for Food Processing, *In* Design and Manufacturing of Agro Processing Machines, Bulletin No. CIAE/APPD/2017-18/230, Central Institute of Agricultural Engineering Bhopal (ICAR), 53-67

Experimental Design and Optimization using MATLAB. *In* Training on Applications of MATLAB Software in Agricultural Sciences and Agricultural Engineering, organized by Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra during March 17-21, 2015.

Curve Fitting using MATLAB. *In* Training on Applications of MATLAB Software in Agricultural Sciences and Agricultural Engineering organized by Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra during March 17-21, 2015.

Continuous Microwave and Infrared Assisted Drying of Spices. 2nd Workshop on Dehydration of Food and Agricultural Products: Principles, Practices and Prospect held at National Institute of Food Technology Entrepreneurship and Management (NIFTEM), Sonepat, Haryana,2015

Hybrid (Combined Osmotic and Pulsed Microwave Vacuum) Drying of Fruits and Vegetable. Invited speaker at 1st Workshop on Dehydration of Food and Agricultural Products: Principles, Practices and Prospect held at National Institute of Food Technology Entrepreneurship and Management (NIFTEM), Sonepat, Haryana, 2014

OTHER INFORMATION

1.McGill University, Canada training sponsorship by Canadian International Development Agency (CIDA) in 2007

2.National Doctoral Fellowship by All India Council of Technical Education (AICTE), New Delhi for PhD at Indian Institute of Technology Kharagpur

3.Cleared ASRB ARS (ICAR) Mains in 2009

Editorial and reviewer activities

1. Guest Editor, Drying Technology in 2010 and 2018

2. Editor, Journal of Food Research and Technology

Acting as reviewer of several international journals related to food science and technology.

About ongoing research projects handled by Dr. P. P. Sutar

1. Development of Cost Effective Microwave-Infrared-UV Assisted Continuous Sterilization Process for Spices

Spices bring a world of flavors, aromas and colors to food. Unfortunately, spices become contaminated with bacteria and molds destroying the flavor and color. Therefore, the sterilization of spices is necessary to reduce the microbial load. In India, spices are sterilized by methods like, ethylene oxide (EO) fumigation, gamma irradiation and steam heating. Currently, EO fumigation is not acceptable in European countries and considered as cancerous chemical in US, gamma irradiation is very costly in India whereas steam sterilization is having a major drawback of moisture condensation in product requiring additional drying cycle. Also, use of steam followed by drying is quality deteriorative and energy intensive process. Therefore, proposed new technique of Microwave-Infrared-Ultraviolet (MW-IR-UV) sterilization process of spices can overcome such problems as thermal sensitivity and quality deterioration, formation of toxic by-products, high-costs and inefficiency. The project includes development of continuous sterilizer using (MW-IR-UV) energy and optimization of process for different spices.

2. Continuous Parboiling and Drying of Paddy using Microwave Energy.

Electromagnetic waves like microwaves and infra-red can transfer energy rapidly and this property coupled with volumetric heating can lead to faster heating rate with short processing time and been applied in a broad range of food processing sectors such as drying, tempering, blanching, cooking, pasteurization, sterilization, hydrothermal treatment (parboiling) and baking especially with regard to energy efficiency. As microwave heating is emerging food heating technology, it can be applied to paddy processing which is major energy intensive process among all agricultural operation.

3. Infrared (IR) Dry Peeling of Agricultural Products

Peeling is used in the processing of many fruits and vegetables to remove unwanted or inedible material, and to improve the appearance of the final product. It is a one of the very important unit operation considered as cleaning operation which removes the contamination of microbial load present with raw material. Now a day in the industry, lye, mechanical (abrasive), and steam peeling methods are commonly used. A novel sustainable infrared method of peeling has a potential to reduce water usage and wastewater disposal while producing high quality peeled products without using lye (sodium hydroxide or potassium hydroxide) and water. As IR radiation heating, does not require any heating medium, such as lye, water, or steam, this technique could have potential to utilize as a novel dry-peeling method for fruit, vegetable and tubers peeling. The higher range of operating temperature of IR can be effectively adapted for microbial decontamination of biological materials.

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