

Fifth International Conference

>*Advances in Solar*

>*Thermal Food Processing*

12-13-14

July 2023

CONSOLFOOD2023

Conference Proceedings

(Last updated: 5th September, 2023)

CIFP SOMESO, A CORUÑA, SPAIN

INSTITUTE OF ENGINEERING; UNIVERSITY OF ALGARVE
CAMPUS DA PENHA; FARO-PORTUGAL

Editors

Juan Bello Llorente

Celestino Rodrigues Ruivo



CONSOLFOOD2023

International Conference on Advances in Solar Thermal Food Processing ,12th, 13th and 14th July 2023, CIFP
Someso, A Coruña, Spain.

Certificate

This is to certify that Beatriz Castillo-Téllez participated in the **CONSOLFOOD2023** - International Conference Advances in Solar Thermal Food Processing on 12th, 13th and 14th July 2023. The accepted work of authors **Castillo-Téllez, Beatriz, Castillo Téllez Margarita, Mejía-Pérez Gerardo Alberto, Martin del Campo Martha Fabiola, Domínguez Niño Alfredo, Vega-Gómez Carlos Jesahel** with title: **Dehydrated fish waste for biofertilizers** was presented as lecture.

Faro, 17th July 2023



Celestino Rodrigues Ruivo
Chairman of CONSOLFOOD2023
Instituto Superior de Engenharia - University of Algarve, Portugal



Contents

1-Introduction

2-Getting further information

3-Searching this document

4-Copyright

5-Members of the Organizing Committee

6-Conference Sessions

7-Abstracts and full length papers

1-Introduction

Authors were invited to submit abstracts for consideration by the *Organizing Committee*. For each accepted abstract, the authors were invited to submit a full paper and a presentation file with audio recorded to be presented in CONSOLFOOD2023.

This document contains all of the *accepted* abstracts and full-length papers submitted for inclusion in CONSOLFOOD2023. It may be updated from time to time if papers are revised, or further full-length papers arising from submitted abstracts are received.

All of the submissions have been scrutinised by one or more members of the *Organizing and Scientific Committee*, but they have not necessarily been revised to accommodate suggestions made by the reviewers. Therefore, they should not necessarily be regarded as having been subjected to strict peer-review.

2-Getting further information

Authors may be contacted via the email address that appears under the title of each abstract or full-length paper. Where several email addresses appear, it is the convention that the name of the corresponding author bears an asterisk (*). If one name has an asterisk, please only contact that author.

3-Searching this document

All full papers and abstracts are listed in according to the programme of the conference sessions.

4-Copyright

The copyright for each of the abstracts and papers contained in these Proceedings remains with the original authors. Before copying or publishing any of them, please contact the author for permission.

5-Members of Organizing and Scientific Committee

Celestino Rodrigues Ruivo, (Chairman),

Institute of Engineering, University of Algarve, Portugal

Association for the Development of Industrial Aerodynamics, Portugal

Juan Bello Llorente, (Local Chairman)

CIFP Someso, A Coruña, Spain

Alberto Hernandez Neto, University of São Paulo, Brazil

Ajay Chandak, PRINCE Suman Foundation, India

Angeles López Agüera, University of Santiago de Compostela, Spain

Armando Inverno, Institute of Engineering, University of Algarve, Portugal

Célia Quintas, Institute of Engineering, University of Algarve, Portugal

Dave Oxford, SLICK Solar Stove, UK

Eduardo Armando Rincón Mejía, Universidad Autónoma de la Ciudad de México, México

Francisco Javier Macias, University of Huelva, Spain

Gianluca Coccia, Marche Polytechnic University, Italy

Hideo Oguri, HUMAN TECH LAB, Japan

João Nuno Pinto Miranda Garcia, Instituto Superior de Engenharia de Lisboa, Portugal

Kartikey Gupta, Vatsalya, India

Luis Paulo Coelho Neto, Instituto Politécnico de Castelo Branco, Portugal

Luther Krueger, Big Blue Sun Museum of Solar Cooking, Minneapolis, USA

Michael Bonke – LAZOLA Initiative for Spreading Solar Cooking, Germany

Octavio García Valladares, Instituto de Energías Renovables, Universidad Nacional Autónoma de México, México

Xabier Apaolaza Pagoaga, University of Málaga, Spain

6-Conference Sessions (cont.)

Day 2 Session 2B (18h28 19h47)	Moderators: Octavio García Valladares, Celestino Ruivo	Country
Thermal evaluation of a mixed tunnel type solar dehydrator under different operating conditions	O. García-Valladares, D. Hernández Tamayo, J.R. Pérez Espinosa	Mexico
CFD modeling and the performance evaluation of a mixed-mode forced convection solar tunnel dryer for curry and coriander leaves	Bhanudas B.Takale, Ranjit S. Patil	India
A case for including solar dehydrators in food processing	P.B. Silva, B. Farrero, L.F. Ribeiro	Portugal
Dehydrated fish waste for biofertilizers	Castillo-Téllez, Beatriz, Castillo Téllez Margarita, Mejía-Pérez Gerardo Alberto, Martin del Campo Martha Fabiola, Domínguez Niño Alfredo, Vega-Gómez Carlos Jesahel	Mexico
Design and construction of a solar dryer with hybridization of solar technologies for drying fish	Margarita Castillo Téllez, Beatriz Castillo Téllez, Alfredo Domínguez Niño, Gerardo Mejía Pérez, Juan E. Andrade Durán	Mexico
Thermofluids' issues of modeling a flat plate solar air heating collector (SAHC) with sensible thermal energy storage (TES) for drying in an energy-vulnerable environment	Antonio Lecuona-Neumann	Spain

DEHYDRATED FISH WASTE FOR BIOFERTILIZERS

Castillo-Téllez, Beatriz¹, Castillo Téllez Margarita^{2*}, Mejía-Pérez Gerardo Alberto¹,
Martín del Campo Martha Fabiola³, Domínguez Niño Alfredo⁴, Vega-Gómez Carlos
Jesahel¹

¹Centro Universitario de Tonalá, Universidad de Guadalajara, Mexico

²Facultad de Ingeniería, Universidad Autónoma de Campeche, Mexico

³Centro Universitario del Norte, Universidad de Guadalajara, Mexico

⁴Instituto de Energías Renovables, Universidad Nacional Autónoma de México, Mexico

e-mail: beatriz.castillo@academicos.udg.mx, mcastill@uacam.mx

Abstract: Fish contains various nutrients necessary for health. However, most fish, such as the bones, the entrails, or the head, is discarded. These wastes have a high content of sodium, calcium, magnesium, and potassium, which enrich agricultural soils and provide crops with the necessary nutrients for their development. Therefore, these wastes present a viable alternative for creating economical and sustainable biofertilizers to empower the small farmer and increase the fishermen's income. In this work, dogfish and tilapia waste were dried in a direct solar dryer made of polycarbonate. The initial moisture content of dogfish was 77.3 g water/100 g ss bh, and the Tilapia was 73.3 g water/g ss (bh). However, if we compare with its moisture content after the drying process, it was observed that the skin of the dogfish species lost a higher moisture content than the bone and clearly than the heads of the Tilapia species, reaching 12.2 g water/100 g ss, also in bh. Furthermore, drying times were shorter for the skin (280 min) compared to tilapia heads (up to 660 min), while drying rates ranged from 0.035 to 3.84 g water/g ss hour for the heads and skin, respectively. The dried waste was ground to obtain fish flour which was analyzed by flamometry, obtaining 699 mg Na/100 gr, 395 mg K/100 gr, and 45,500 ppm of calcium. This flour mixed with soil allowed cucumber seeds to germinate, which did not germinate in not enriched soil.

Keywords: Solar Drying, biofertilizers, fish waste.