Improvement of pearl millet protein extractability using various solvent and chromatographic separation

R. Bibi1,2, K. Khaladi1,2, B. Nadjiemi1,2, H. Mokrane1
1 Laboratoire des produits bioactifs et valorisation de la biomasse (LPBVB), Ecole Normale Supérieure, Kouba, Alger, Algérie
2 Faculté des sciences, Université Benyoucef Benkheda (Alger1), Alger, Algérie
3 Laboratoire de développement des techniques de traitement et de gestion environnementale, Ecole Normale Supérieure, BP 92, Kouba, Alger, Algérie

* Khaladmiral@yahoo.com

Of all the world’s cereals, pearl millet (Pennisetum glaucum (L.) R. Br) is the sixth most important after wheat, rice, barley, maize and sorghum. Pearl millet is the major source of energy and protein for millions of people in many underdeveloped countries in Africa and Asia. Compared to other cereals, greater quantity of pearl millet grains could be produced in short growing season.

The objective of this work was to characterize the composition of pearl millet proteins by RP-HPLC. Various extraction methods were assessed including the conventional use of 70% ethanol at 60°C under non-reducing or reducing conditions. Three reducing agents were used: β-mercaptoethanol, dithiothreitol (DTT) or sodium metabisulfite at different concentrations. A combination of organic solvent and alkaline extraction was tried.

RP-HPLC analysis showed that 70% ethanol+1% DTT +0.4% NaOH at 60°C extracted more millet protein. This new method was more reproducible and more accurate than the other ones tried in this work.

Keywords: Pearl millet, protein, Extraction, RP-HPLC

References

In the heart of volatile compounds of jicaro seeds

M. Lebrun1, C. Corrales Hernández1,2, N. Forestier1, I. Maraval, A.M. Pérez3, F. Vaillant1, and G. Fliedel1
1 CIRAD, UMR QualiSud, F-34398, Montpellier, France
2 UNAN, Facultad de Ciencias Químicas, Ingeniería de los Alimentos, León, Nicaragua
3 Universidad de Costa Rica, Centro Nacional de Ciencia y Tecnología de Alimentos, San José, Costa Rica

In Central America, a popular beverage is made from some roasted oilseeds, named jicaro seeds. Jicaro seeds are numerous and embedded in the pulp of the fruit of jicaro (Crescentia alata H.B.K.), a calabash tree, native from Mexico and spread in dry areas of Central America. After fermentation, the seeds are separated from the pulp, sun dried and roasted in order to develop a specific flavor before being ground and used for making the beverage. These seeds are highly valued in several countries of Central America due to their high nutritional value and pleasant aroma.

The aim of this study was to understand the effect of roasting on the composition of volatile compounds of jicaro seeds. Qualitative and quantitative determinations of volatile compounds in unroasted and roasted jicaro seeds (140°C for 140 s) were carried out using Solvent Assisted Flavor Evaporation (SAFE) and Gas Chromatography/MS (GC/MS).

A total of 27 volatile compounds were identified and quantified. Styrene appeared to be the main compound with a concentration of 22.57 and 47.0 mg/kg in unroasted and roasted seeds respectively. Many volatile compounds were identified as aldehydes. Most of compound concentrations increased with the roasting process, except for some alcohols or esters. A decrease of some reducing sugars and free amino acids was observed, probably due to Maillard reactions.

Additionally, 22 impacting odor compounds of roasted seeds, extracted by Headspace Solid Phase Micro Extraction (HS-SPME), were identified by ten untrained panelists using Gas Chromatography-Olfactometry (GC-O). Ethyl-2-methylbutyrate was the only one recognized by 100% of the panelists as characteristic of jicaro note with concentrations of 0.16 mg/kg and 0.47 mg/kg in unroasted and roasted seeds respectively. Many volatile compounds were already found in the unroasted seeds (19 out of 27). Others appeared in roasted seeds such as pyrazines and aldehydes. Most of compound concentrations increased with the roasting process, except for some alcohols or esters. A decrease of some reducing sugars and free amino acids was observed, probably due to Maillard reactions.

Keywords: Jicaro seed; roasting process; volatile compounds

References
Book of Abstracts

2-4 November 2016, Barcelona / Spain

THE FOOD FACTOR I
Barcelona Conference

Established, emerging and exploratory food science and technology.

http://www.foodfactor.org
Book of Abstracts

The Food Factor I Barcelona Conference, 2-4 November 2016, Barcelona (Spain)
INTRODUCTION

This book contains a selection of the abstracts that were accepted for presentation at The Food Factor I Barcelona Conference, Established, emerging and exploratory food science and technology, which was held at the University of Barcelona, Spain, from 2 to 4 November 2016.

The first edition of this Food Factor Conference gathered around 250 participants, coming from more than 45 countries. And around 280 works were presented at the conference. This was a more than satisfactory level of attendance for this first research forum, especially in the context of a global budget constraint.

The organization called for research papers dealing with the following topics:

**Food chemistry and biochemistry**
Topics: structure and function of major and minor components (either nutrient or non-nutrient) of foods, the biochemical changes produced during handling, storage, post-harvest/morret processing, distribution or due to domestic conditions, and their impact on nutritional, physiological, sensorial, or toxicological properties and safety; Reports on new or improved techniques or methods for addressing these topics or on the chemistry of food contacting materials. Specific areas of interest were:
- Food bioactives
- Chemistry of food additives and preservatives
- Chemical analysis for the determination of authenticity and origin of foods
- Biochemical changes in cereal grains and legumes due to postharvest conditions and treatments (storage, germination, fermentation…)
- Biochemical changes in postharvest fruits and vegetables with impact in quality
- Biochemical changes produced in the conversion of muscle into meat and fish
- Biochemistry of the biosynthesis of milk components
- Biochemical changes of the transformation of milk into dairy products
- Browning reactions in foods
- Lipid peroxidation
- Computational chemistry in food research
- Chemistry of food packaging and food-handling materials

**Food microbiology**
Topics: microorganisms that are related to human nutrition and health: those used to make foods or whose use and/or consumption can improve food production or host health; the detection, identification and quantification of those that pose a threat to food safety or quality (also applied to microbial toxins and metabolites and foodborne viruses); the study of their biology (biochemistry, ecology, genetics, physiology…); their role in various food processing methods and in food spoilage; their susceptibility to different physical or chemical agents, processing or packaging methods; or their interaction with different food chain environments and foodstuff, reports on the development and application of mathematical and computational tools in food research. Specific areas of interest were:
- Rapid detection of foodborne pathogens
- High throughput screening
- Norovirus and other viral agents in foods
- Antimicrobial/biocide resistance
- Microbial risk analysis: assessment, management and communication
- Microbiology of fermented foods and beverages
- Food defense

**Food contamination**
- Mycotoxins
- Intestinal microbiota and host health
- Hygienic design of food manufacturing lines
- Epidemiology of foodborne pathogens
- Spoilage of soft drinks (with increasing levels of nutrients)
- Biofilms
- Cross-contamination
- Beneficial microbes
- Food parasites
- Microbial nutrition; probiotics
- Bacterial and fungal species: *Yersinia, Bacillus, Staphylococcus, Listeria, Salmonella, Escherichia coli, Vibrio, Campylobacter, Brucella, Mycobacterium, Clostridium, Streptococcus,* and others; Aflatoxins and other microbial-derived toxins; Norovirus, Rotavirus, Hepatitis virus and other viral agents

**Food physics**
Topics: understanding and measurement of the physical properties of foods and their constituents: structural, rheological, textural, optical, electrical, thermodynamic, flowing, acoustic, mechanical…, how they change during processing, the relationship between the properties of their constituents (water, proteins, fats, oils, gasses, and minor constituents like vitamins and minerals) and their macroscopic properties (texture, taste, smell, colour, nutritional and health impact), or the developments of purely physical ways of treating foods, either thermal or non-thermal. Specific areas of interest are:
- Thermal modification of foods: heat-moisture treatment, annealing, microwave heating, osmotic pressure treatment…
- Non-thermal modification of foods: ultrahigh-pressure treatments, instantaneous controlled pressure drop, high-pressure homogenizers, dynamic pulsed pressure, pulsed electric fields, freezing, thawing…
- Multiscale computer simulation and mathematical modeling of food structures
- Novel microscopy, image analysis, and characterization techniques
- Soft matter physics applied to food materials
- Colloidal structures, their interactions and relationship with food stability and overall macroscopic properties
- Modern technologies for sensory analysis
- Relationship between physical properties of food and consumer preferences

**Food analysis**
Topics: analysis of foods and their constituents (amino acids, peptides, proteins, phenolic compounds, carbohydrates, DNA fragments, vitamins, functional ingredients or nutraceuticals, toxins, pesticide and drug residues, industrial, processing and packaging contaminants, additives, allergens, antibiotics, nanoparticles,…) by the use of analytical and imaging techniques and methods, in the context of the assessment of food structure, quality, safety, traceability, origin, authenticity, health benefits of certain constituents…; works featuring the analysis of large amounts of data generated by different techniques or time series of many variables (chemometrics). Specific areas of interest were:
- Instrumental techniques: biological, separation, spectroscopic, rheological, thermal, radiochemical, electrochemical, miniaturized microfluidic systems, modern foodomics and/or systems biological approaches…
- Imaging techniques: optical, confocal, electron, atomic force microscopies…
- Analysis of sensory properties of foods
Food processing and packaging
Topics: established and novel processing and packaging technologies applied for delivering foods that last longer before spoiling (preservation), and that are available, safe, nutritious, and convenient, while minimizing environmental impact. Specific areas of interest were:
- Active and intelligent packaging
- Migration and potential health effects of packaging-associated chemicals of concern
  (Bisphenol-A, semicarbazide…)
- Modified atmosphere packaging
- Established and modern processing and preservation technologies: drying, cooling, freezing, heating, salting, fermentation, pasteurization, additives addition, irradiation, hurdle technology, use of high-pressure and pulsed electric field processing, dense phase carbon dioxide, ozone, ultrasonics, cold plasma, IR technologies, natural antimicrobials, oxygen depleted storage, microwave heating, low shear extrusion…
- Green technologies: supercritical fluid extraction, membrane technology, bioconversions…
- Biorefinery in the production of food components (proteins, carbohydrates, fats…)
- Dietary, health, and environmental concerns related to food processing
- Waste reduction in food processing and valorization of by-products

Food engineering and hygienic design
Topics: (hygienic) design and (safe) operation of food plants, including engineering tools for assessing and managing risks. Specific areas of interest were:
- Heat, mass transfer and fluid flow in food processing
- Artificial intelligence in food research and industry
- Mathematical modelling and software development for food research and industry
- Finding, correcting and preventing hazards in food industry: Hazard Analysis and Critical Control Point (HACCP), Microbial Risk Assessment (MRA)…

Environmental impact of food production and consumption
Topics: environmental impact of the food supply chain (carbon and water footprint, biodiversity, land use…), for each of the food groups. Specific areas of interest were:
- Food waste impact on climate, water, land and biodiversity
- Ways of reducing environmental impact
- Environmental impact of meat production

Foods of plant origin
Topics: plant, animal, crop or soil science relevant to the production of foods of plant origin: cereals, legumes, fruit and vegetables, sugar crops. Specific areas of interest were:
- Understanding phytobiomes for improved crop productivity
- Farming animal science: cattle, sheep, goats, horses, pigs, poultry
- Soil science
- Sustainable farming systems
- Genetic and non-genetic crop improvement
- Plant and crop protection
- Crop models
- Improvement of water use
- Resistance to pests and disease
- Modification of crops for reducing waste
- Filling the gap between plant and crop physiology
- Stress in crops produced by changing environmental conditions

Foods of animal origin
Topics: animal, vegetal, soil or marine/aquatic science relevant in the production of foods of animal origin: meat, fish, milk and their derived products, eggs, insects…

The regular conference program was complemented with two Plenary Lectures:
“Highlighting natural value: physical and chemical approaches in food processing” by Isabel C.F.R. Ferreira, from the Mountain Research Centre (CIMO), ESA, Polytechnic Institute of Bragança, Portugal
“Nonthermal processing technologies for food: Current applications and future perspectives” by Pedro Elez-Martínez, from the University of Lleida, Spain

We hope attendants and readers in general will find the content of this book of abstracts interesting, inspiring and useful and we look forward to seeing you in another fruitful edition of the conference in 2018.

The Organizing Committee
Food Factor I Barcelona General Coordinator
Formatex Research Center
C/Zurbarán 1, Planta 2, Oficina 1
06002 Badajoz
Spain