



FoodPro

Jan - March 2021



Polyphenol Rich Chocolate



Chestnut based gluten free cookies



Baked snack



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Research Highlights

Sequential drying of apple slices using Radiofrequency heating and Low humidity air (LHA)

There are currently no studies on the use of RF heating as a primary or secondary stage drying process for apple slices with Low Humidity Air (LHA), as well as comparisons to other methods. As a result, sequential drying of apple slices using Radiofrequency (RF) waves and low humidity air (LHA) was tried. The effectiveness of using RF at the primary (RF + LHA) and secondary (LHA + RF) drying stages with LHA was compared to LHA, HA (hot air), and RF (2A) drying, individually at 40°C. As compared to Freeze-drying (FD), the polyphenols (98%), flavonoids (87%), and ascorbic acid (77%) were well preserved in apple slices dried with the sequential LHA + RF approach. The colour ($\Delta E = 7.4 \pm 0.7$) was unaffected by sequential drying, and the rehydration ratio (3.9 ± 0.1) was increased. The principal component analysis revealed that LHA + RF retained more volatile compounds (aldehydes, esters, acids, and alcohols) than the other methods investigated. According to this analysis, the application of LHA + RF at the secondary stage sequentially dried apple slices had the majority of the qualities of FD while significantly reducing the drying time. It was demonstrated how important it is to choose the right sequence during sequential drying in order to improve process efficiency and

product quality. As a result, other heat-sensitive food materials could be investigated using this approach

(Source: Sandhya R. Shewale., Deependra Rajoriya., Bhavya M. L., Umesh Hebbar H., Application of radiofrequency heating and low humidity air for sequential drying of apple slices: Process intensification and quality improvement, LWT - Food Science and

Role of lutein in adipogenesis and its impact on molecular markers of adipocyte differentiation

Obesity is characterised by a dysregulated adipogenesis process in which adipocytes increase in number (hyperplasia) and size (hypertrophy). The role of lutein, in adipogenesis and its impact on molecular markers of adipocyte differentiation at various stages using the commonly used 3T3-L1 in vitro model is explained. Carotenoid treatment was carried out to analyze the effect of lutein and β -carotene on adipocyte differentiation throughout differentiation by WST-1 assay. Lipid droplets in mature adipocytes were observed using Oil Red O and Nile red staining. RT-PCR and western blotting were used to investigate the impact of lutein on gene and protein expression of major transcription factors and adipogenic markers. Flow cytometry was used to investigate the role of lutein in mitotic clonal expansion. In lutein-treated (5 μ M) cells, the accumulation of lipid droplets was significantly reduced ($p < 0.05$). The downregulation of two

major transcription factors, PPAR- γ and C/EBP- α which co-ordinate the expression of genes that form and sustain the adipocyte, was linked to the inhibition of lipid accumulation. Following that, lutein suppressed FAS, FABP4, and SCD1 gene expression in mature adipocytes, preventing CEBP- and PPAR- protein expression in the early stages of adipocyte differentiation. The repressed phosphorylation of AKT and ERK is related to the early-stage inhibition of adipocyte differentiation. Further, in lutein-treated adipocytes, upregulated cyclin D and downregulated CDK4 and CDK2 enumerate its role in delaying cell cycle

progression at the G0/G1 phase. This study identified lutein as a versatile molecule that, in addition to playing an important role in embryonic development and disease prevention, has an inhibitory effect on adipocyte differentiation, which increases its utility in the fight against obesity.

(Source: Sowmya Shree Gopal., Sachin M. Eligar., Baskaran Vallikannan., Ganesan Ponesakki., *Inhibitory efficacy of lutein on adipogenesis is associated with blockage of early phase regulators of adipocyte differentiation*, *BBA - Molecular and Cell Biology of Lipids*, 2021, 1866, 158812)

IPR in the Horizon

Nutritional composition for Endurance performance enhancement of Athletes

Endurance exercises are divided into three phases: phase 1 requires glycogen synthesis, phase 2 requires insulin release from pancreatic cells to transport both hepatic glucose from gluconeogenesis and exogenous glucose into muscle cells, and phase 3 requires rapid amino acid absorption, muscle protein synthesis, and repair of damaged muscle fibres. As a result, a food supplement that supports these metabolic needs is recommended. A nutraceutical-based food supplement which is tailor-made to cater to metabolic requirements of different phases,

including activation of the cell's metabolic sensor; AMPK-, and PGC-1; master regulator of mitochondrial biogenesis, was developed. Hence, a nutritional composition containing pomegranate juice, green tea extract, cinnamon, lemon extract, beet root juice, honey, protein concentrate, sugar, salt, and pectin was formulated to improve stamina. It offers an endurance-enhancing, nutritionally-enriched, anti-fatigue food supplement or nutritional composition in gel-solid form that is stable at room temperature, without the addition of preservatives, colouring, flavouring agents or chemicals. This formulation is designed for use before, during, and after physical activities such as long-distance running, trekking, swimming, cycling, cricket and other endurance exercises.

New Technologies

Process for flavour essence from *Decalepis*

A process has been developed as a natural flavour additive for the food industry. The natural flavour essence prepared from tuberous roots of *Decalepis hamiltonii* has of great significance, as its potential is not limited to vanillin type flavour alone; its root has medicinal properties as well. The vanillin flavour attributing the molecule is 2-hydroxy-4-methoxy benzaldehyde, an isomer of vanillin. Apart from this, various bioactive compounds such as phenolics and flavonoids in the formulation contribute to antioxidant activity as well. The process is based on water



extraction method which is completely devoid of solvents and storage of six months confirmed that the product is free of microbial load. Moreover, it can be used directly with appropriate dilutions as per end users' requirements for imparting vanillin flavour to a wide range of food products viz., bakery products, condiments, snacks, ice-cream, and beverages etc. This natural flavour essence is a good alternative to synthetic flavours.

Beverage concentrate in collapsible tube

Beverage concentrate was formulated keeping in view of the need for giving nutritious drink to the consumers of all walks of life including children. The packing (collapsible tubes) was selected to facilitate easy to carry and use. The pack size and collapsible tube will be useful to people who are travelling regularly. The concentrate can be used as a spread or drink.

Subjects	%RDA provided by the product (200 ml)		
	Vitamin A	Iron	Calcium
Men	18-20%	14-22%	1.3-2%
Women	18-20%	11-17%	1.3-2%

As it is packed in collapsible tubes, children can make their own drink and use as a spread and

make their own meal. Four such fruit concentrates Mango, Guava, Pineapple and mixed fruit and vegetable were standardised.



Technologies Transferred

- ✦ Fermented and dehydrated ready mixes for idly and dosa batter (Ashwarooda Enrich Foods, Bengaluru; Svastha Breakfast Solutions, Bengaluru)
- ✦ Groundnut (Peanut) butter (SMS Enterprises, Mysuru)
- ✦ Tomato products: preparation (Parvat Premium Agro products, Bengaluru)
- ✦ Osmo-air dried fruits (Amla, Jackfruit, Mango, Pineapple) (Fruganic Food Pvt Ltd., Kozhikode; Mother Organization, Tumkur)
- ✦ Online fortification of atta/maida (Himalayan Spices, Meghalaya)

- ✦ Preparation of ready to cook multigrain whole mix for drink/porridge (Nidhi Food Products, Puttur)
- ✦ Virgin coconut oil (Yakshasri Agri Products, Udupi)
- ✦ Dolly mix (Mr. B Adithya Rao, Telangana)
- ✦ Coffee concentrate (Sri Uma Coffee Pvt Ltd, Kushalnagar)
- ✦ Nutri fruit bars with immune boosters (Mother Organization, Tumkur)
- ✦ Pickles and chutneys: preparation (Mother Organization, Tumkur)
- ✦ Fruit jams and jellies: preparation (Mother Organization, Tumkur)
- ✦ Instant cake mix (Mr. Mohammed Saeed K, Kerala)

Entrepreneurs Speak..

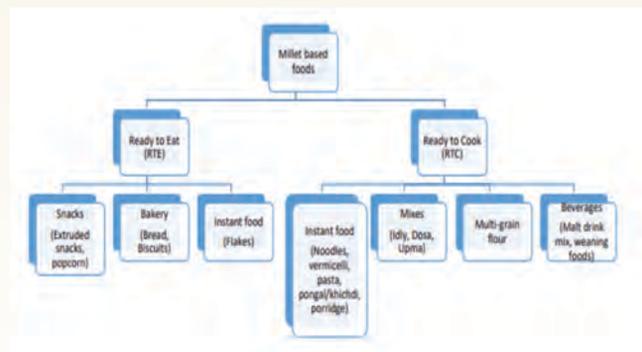
Saakya Foods

With raising health consciousness and environmental concerns, number of people who prefer healthy/nutritious food and environmentally friendly grains have increased in recent years. Millets offer healthy and environmentally friendly foods. Millets are a group of highly variable small-seeded grasses, widely grown around the world as cereal crops/grains. They are very high in their nutrition content and rich in B vitamins, calcium, iron, potassium, magnesium, zinc, also gluten-free and has low-GI (Glycemic index) thus millets are suitable for people with allergies/intolerance of wheat. Also, for diabetic and weight loss millets are excellent.

To utilize the opportunities in India's food processing sector and people's interest in millet consumption, Saakya Foods (SF) has taken CSIR-CFTRI technology for the production of Millet based value added products.

Products

Saakya Foods are planning to bring Ready to Eat (RTE) and Ready to Cook (RTC) products as shown below



Vision and Challenges: The vision of Saakya Foods is to offer a portfolio of healthy food products to customers at affordable price.

Key challenges: In the current Covid-19 situation, channel acquisition and customer reach, customer branding competition from established and upcoming food processors, changing the eating behaviour of customers are the challenges faced by the start-ups.

Role of CFTRI

We are working in the cottage level so far. The key issues faced include: ingredient proportion,

consistency of taste, quality and storage requirements. Also scaling up to commercial level is also need to be addressed.

Now with the standardized technology and processes from CSIR-CFTRI along with training, we will be able to take it forward. CSIR-CFTRI brand would also provide assurance to the customers about quality of the products.

Your advice to emerging startups

My advice for emerging start-ups to keep patience as some of activities including loan processing, machinery supply etc. would take a longer period during setting up of the production.

New Collaborations

Denovo BioLabs Pvt Ltd., Bengaluru (Feb 12, 2021)

The company has undertaken commercialization of the aptamer developed by CSIR-CFTRI for the detection of SARS-CoV-2 virus after validation and regulatory approval



Department of Women & Child Development and Mission Shakti, Govt. of Odisha, Odisha (Feb 25, 2021)

In the Supplementary Nutrition Programme (SNP) under the Integrated Child Development Services (ICDS) scheme, Department of Women & Child Development and Mission Shakti, Government of Odisha entered into an agreement with the Institute for improving the quality of Take Home Ration (THR), upgrading regional laboratories, testing of THR samples, mentoring Women Self Help Groups and capacity building.

St. John's Research Institute, Bengaluru (Mar 15, 2021)

Both the institutions signed the agreement to prevent the linear growth faltering that occurred in infants. The collaboration's would come out with a pilot scale process for developing shelf stable Take Home Rations (THR) for the infants.

JSS Science & Technology University, Mysuru and JSS Academy of Higher Education, Mysuru (Mar 24, 2021)

It is planned to develop a machine learning model for suggesting a personalised menu to diabetics under this collaboration



Xavier Institute of Management & Entrepreneurship (XIME), Bengaluru (Jan 7, 2021)

CSIR-CFTRI signed a MoU with XIME on the theme "Entrepreneurship Capacity Development in Food Processing Sector" to promote and nurture Startups and Entrepreneurs. Faculties from XIME

delivered lectures under various training programmes conducted under PMFME and DST-TEDP in the Institute.

Shivaji University, Kolhapur (Mar 12, 2021)

The generic MoU aims to improve intellectual cooperation in the field of food science and technology between the two institutions.

Institute of Bioresources and Sustainable Development (IBSD), Imphal, Manipur (Mar 22, 2021)

Relevant R&D and outreach programmes for the North East region will be conducted under this MoU, with support from external funding agencies.



Sareth Superfoods Pvt Ltd., Bengaluru on (Mar 2, 2021)

With agro-technologies developed by CSIR-CFTRI, the agreement is intended to assist farmers to grow Chia in different parts of the state.



Kerry Ingredients India Pvt Ltd., Bangalore (Mar 25, 2021)

Under this initiative, meritorious students who are pursuing MSc (Food Technology) will be supported with scholarships during their studies.



Events

Capacity Building (Jan 18, 2021)

Inauguration of Capacity Building on Food Processing for aspiring and existing Entrepreneurs (SC-ST) under NSSH, Ministry of MSME was held on January 18, 2021. Mrs. A. Kokila, Head, National SC-ST Hub, Regional Office, Bengaluru inaugurated and Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI presided the inaugural function. A total of 88 participants were trained under this programme.

Farmer's Training under PMFME (Jan 19, 2021)

Farmer's Training on Food Processing under 'PM FME'(PM Formalisation of Micro food processing Enterprises) Scheme in association with Dept. of Agriculture, Govt. of Karnataka and KAPPEC was launched on January 19, 2021 by Sri. B.C. Patil,

Hon'ble Minister of Agriculture, Govt. of Karnataka. Shri B. Sivaraju, MD, KAPPEC, Govt. of Karnataka explained in brief about the scheme. Dr. P. Chandra Shekara, DG-MANAGE, Hyderabad and Shri S.I. Chikkanagoudra, Chairman, KAPPEC, Govt. of Karnataka were present. Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI presided.

Under this scheme, training programmes were conducted aligning with One District One Product (ODOP). A total of 321 Farmers/FPO entrepreneurs across the state were trained.

- ✦ Fruits and Vegetables Processing (Jan 11-16, 2021)
- ✦ Plantation Products (Jan 18-23, 2021)
- ✦ Bakery Products & Confectionery (Feb 1-6, 2021)
- ✦ Millet Processing (Feb 8-12, 2021)

- ✦ Processing of Millets & Pulses (Feb 8-13, 2021(I), March 1-6(II))
- ✦ Processing of Meat & Marine Products (Feb 15-20, 2021)
- ✦ Processing of Oil seeds (Feb 22-27, 2021)



Covid Warriors Felicitation (Jan 29, 2021)

Felicitation of Covid Warriors (associated with CSIR-CFTRI Covid Testing centre) was held on January 29, 2021. Smt. Rohini Sindhuri, IAS, District Commissioner, Mysore was the Chief Guest and delivered the inaugural address. The meeting was presided by Director, CSIR-CFTRI.



Colloquium (Jan 20, 2021)

A Virtual Colloquium on “Translating Academic Research to Entrepreneurship” was held on Jan 20, 2021 at CSIR-CFTRI and Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI presided over the function.

Virtual Conference (Feb 24, 2021)

Pesticide Science Study Group at CSIR-CFTRI hosted an International virtual conference on “Emerging Trends in Food Protectants and Infestation Management – 2021” on Feb 24, 2021. Dr. Prakash M Halami, Chief Scientist & Head, Microbiology & Fermentation Technology welcomed the participants and Dr. Sridevi

Annapurna Singh, Director, CSIR-CFTRI, delivered the inaugural address. Eminent scientists in the field presented the conference theme and technical sessions.



Technology based Entrepreneurship Development Programme (TEDP) (Feb 25-Mar 30, 2021)

Technology based Entrepreneurship Development Programme (TEDP), “Innovation and Entrepreneurship” sponsored by Department of Science and Technology (DST) was held on virtual platform from Feb 25-Mar 30, 2021. Ms. C. N. Meena Nagaraj, IAS, Director IT&BT and MD, KITS, Govt. of Karnataka inaugurated the programme. Dr. Bharathi S. Meti, HoD Dept. of Biotechnology, BEC Executive director (BEC STEP), Bagalkot as DST observer made her remarks. Dr. Alok Srivastava, Chief Scientist, CSIR-CFTRI presided over the function.

The 6 weeks programmes consisted of 7 modules of different topics in which 30 budding entrepreneurs from 15 states across the Nation participated. Lectures by 38 internal and 40 external faculties from Academia, Research, Industry, Banking, and Finance shared their knowledge of experience on the occasion.

In the Valedictory Function, Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI addressed the participants.



National Science Day (Mar 1, 2021)

National Science Day celebrations was held in the Institute in which Dr. G. R. Chandak, Chief Scientist & Group Leader, CSIR-CCMB, Hyderabad delivered the lecture "A Journey from simple to complex genetic disorders: The Silver Jubilee". Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI, presided.



Visit of Delegations

Shri S. Niranjana Reddy, Hon'ble Minister for Agriculture, Govt. of Telangana and officials visited CSIR-CFTRI on Jan 30, 2021 and interacted with Scientists.



Shri Kawasi Lakma, Hon'ble Industries Minister, Govt. of Chhattisgarh visited CSIR-CFTRI on Feb 4, 2021 to explore potential collaborations towards establishing a food safety laboratory in the state



Shri R. Shankar, Hon'ble Minister for Sericulture & Horticulture, Govt. of Karnataka visited CFTRI on Feb 19, 2021 and interacted with Scientists. On this occasion, PMFME Guidelines (Kannada) Booklet was released.



Selected Publications

- ✦ Rekha, M.J., Bettadaiah, B.K., Muthukumar, S.P., Govindaraju, K., Synthesis, characterization and anti-inflammatory properties of karanjin (Pongamia pinnata seed) and its derivatives, *Bioinorg. Chem.*, 2021, 106, art. no. 104471. (IF: 4.831)
- ✦ Bruno Siewe, F., Kudre, T.G., Narayan, B., Optimisation of ultrasound-assisted enzymatic extraction conditions of umami compounds from fish by-products using the combination of fractional factorial design and central composite design, *Food Chem.*, 2021, 334, art. no. 127498. (IF: 6.306)
- ✦ Kaira, G.S., Kapoor, M., Molecular advancements on over-expression, stability and catalytic aspects of endo- β -mannanases, *Crit Rev. Biotechnol.*, 2021, 41 (1), pp. 1-15. (IF: 8.108)
- ✦ Sunil, L., Appaiah, P., Martin, A., Vasu, P., Characterization of in silico modeled synthetic protein enriched with branched-chain amino acids expressed in *Pichia pastoris*, *Int. J. Biol. Macromol.*, 2021, 168, pp. 518-525. (IF: 5.162)

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