

FoodPro

April - June 2023

Food Processing
Nutrition
Innovation
Value Addition
Traditional Foods
Food Machinery Shelf Life
Food Quality Nutraceuticals
Centre of Excellence
Pre & Probiotics PMFME
Skill Development
Technology Transfer
Incubation



Curtain Raiser of
One Week One Lab (OWOL)
by Dr. N. Kalaiselvi, DG, CSIR



Inauguration of
World Environment Day
by Shri. Suresh Heblikar



ಸಿ.ಎಸ್.ಐ.ಆರ್.-ಕೇಂದ್ರೀಯ ಆಹಾರ ತಾಂತ್ರಿಕ ಸಂಶೋಧನಾಲಯ, ಮೈಸೂರು
सीएसआईआर-केन्द्रीय खाद्य प्रौद्योगिक अनुसंधान संस्थान, मैसूरु
CSIR-Central Food Technological Research Institute, Mysuru

(Council of Scientific & Industrial Research)
Mysuru - 570 020

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Research Highlights

Phenolics of browntop millet extracted in solvents with varying polarities

The Browntop millet (*Urochloa ramosa* L.), commonly known as "Dixie signal grass", is one of the ancient minor millets belonging to the family *Poaceae*, majorly cultivated in Southeast Asia and Africa for forage and also it serves as the main source of food in the region. Due to its excellent dietary profile and utility as a healthier substitute for the common ingredients used in gluten-free foods, there is an emerging interest in incorporating browntop millet in various food systems to derive health benefits. However, there has been limited research on the phenolic content and their bioactivities. In addition, solvent polarities are known to affect the composition and extractability of millet phenolics. Therefore, this study focused on determining the effect of solvents with varying polarities on the phenolic profiles of browntop millet and evaluation of their contribution to regulate oxidative stress. Furthermore, the contributions of millet phenolics in inhibiting enzyme activities associated with hyperglycemia were also assessed.

Phenolics of browntop millet extracted in solvents with varying polarities [water, methanol, acetone (80%), ethanol (70%)] were comparatively assessed for their phenolic profiles, antioxidant activities, DNA damage protection and enzyme inhibitory properties. The different extraction solvents and their polarities significantly influenced the total phenolics, individual phenolic compounds, antioxidant activities and enzyme inhibitory properties of the millet. The 80% acetone and 70% ethanol were the most effective solvents for extracting millet phenolics and their antioxidant

activities. Gallic, caffeic, and ferulic acids were the major phenolic acids, myricetin and kaempferol were the most abundant flavonoids detected in all the extracts of browntop millet. Furthermore, these phenolic extracts also efficiently protected DNA from oxidative damage and inhibited enzymes relevant to hyperglycemia. The extraction ability of solvents with varying polarities distinctly affected phenolic content and composition. The structure and physicochemical properties of the phenolics may have contributed to their solubility in a particular solvent. Overall, this study revealed the bioactive phytochemicals in underutilized grain and suitable solvents to enrich their bioactivities. These insights may help to exploit the use of underutilized browntop millet as ingredients in value added products for management of diabetes and functional foods to promote their use for risk reduction and overall health.

(Source : Sunagar, R. R., & Sreerama, Y. N. (2023). Implication of solvent polarities on browntop millet (*Urochloa ramosa*) phenolic antioxidants and their ability to protect oxidative DNA damage and inhibit α -amylase and α -glucosidase enzymes. *Food Chemistry*, 411, 135474.)

Modification of pearl millet flours using dry heat and ultrasonication to increase the resistant starch content

Pearl millet (*Pennisetum glaucum*) is a major millet crop grown in the Indian subcontinent and Africa. Pearl millet is rich in protein, essential fatty acids such as linoleic acid, iron and zinc when compared to other cereal grains. It also has higher starch content and considered as a good source of energy in the human diet. Lifestyle-related disorders such as obesity and diabetes increased in recent years forcing researchers to modify the properties of starch to make it beneficial to health. Pearl millet flour was subjected to dry heat (thermal),

ultrasonication (non-thermal) and evaluated for thermal, pasting, crystalline, and in-vitro starch digestibility properties. The dry heat treatment of pearl millet flour altered its thermal, crystalline, and pasting properties with an increase in resistant starch content and reduced the glycaemic index significantly. The ultrasonication treatment for lesser duration increased the formation of slowly digestible starch. The combination of ultrasonication followed by heat also modified the crystalline regions of starch. Among the treatments, dry

heat treated pearl millet flour had the highest resistant starch content. These modified pearl millet flours using green technologies with higher resistant starch content could find application in low GI food products for targeted population and probiotic industry.

(Source: Vidhyalakshmi, R. and Meera, M. S. (2023) Dry heat and ultrasonication treatment of pearl millet flour: effect on thermal, structural, and in-vitro digestibility properties of starch. *Journal of Food Measurement and Characterization*, 17. pp. 2858-2868.)

New Technologies

Gluten-Free Cakemix

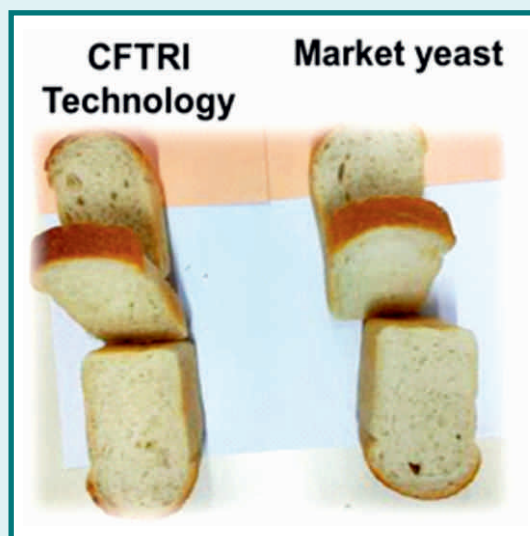
Most of the gluten-free products in the market are based on pure starch and are low in nutritional quality. Buckwheat-based gluten-free cakemix is targeted and developed as a specific product for celiac patients. It is higher in protein (12-15 %), fiber (8-10 %), iron (5-6 mg/100 g) and zinc (2-3 mg/100 g) contents, as compared to many of the gluten-free products available in the market. It consists of all the functional ingredients for making cake, saves preparation time and eliminates ingredient selection hassles. The gluten-free cakemix is suitable for both commercial and home bakers. The cake mix can be used to produce muffins, cup-cakes or pastries using both conventional oven and cooker. It will serve the growing consumer demand for healthy and convenient foods.



Baker's Yeast

As the name suggests, baker's yeast is used for baking bread and other bakery products, serving as a leavening agent which causes the bread to rise (expand and become lighter and softer) by converting the fermentable sugars present in the dough into carbon

dioxide and ethanol. Fresh baker's yeast consists of approximately 30-33 % of dry materials, 6.5-9.3 % of nitrogen, 40.6-58.0 % of proteins, 35.0-45.0 % of carbohydrates, 4.0-6.0 % of lipids, 5.0-7.5 % of minerals and various amounts of vitamins, depending on its type and growth. Commercially available fresh baker's yeast are in liquid, creamy or compressed and active dry yeast forms. Compressed baker's yeast is the most commonly used product, consisting of only one yeast species, *S. cerevisiae*. CSIR-CFTRI process demonstrates the commercial production of baker's yeast. The process technology for baker's yeast can be divided into upstream and downstream processing. The upstream primarily involves rejuvenation of yeast strain and preparation of inoculum for the production scale followed by fermentation. The downstream processing involves separation and washing. The operational parameters have been optimized for improved enzyme production at pilot scale level. The obtained cake to be packed in wax paper and the unwrapped wax packet has shelf-life of 20-30 days, when stored at 4°C. Compressed Baker's yeast from this process showed good dough raising capacity (138%) making it suitable for bread leavening. Breads baked with compressed baker's yeast from CSIR-CFTRI process and commercial yeast had same product qualities.



Technologies Transferred

- ✦ Fruit dehydration: Banana (Mrs. Sanjot Nikam, Maharashtra)
- ✦ Instant gravy mixes (dehydrated) – Madras kurma, Multi-Purpose Gravy, Biryani mix (Rohitraj Foods Pvt.Ltd., Maharashtra)
- ✦ Instant products from moringa leaves (Shri Shaila Organics, Bengaluru)
- ✦ Preparation of shelf stable biriyani paste (G.K Traders, Tamilnadu)
- ✦ Chikki/Nutra chikki (3 formulations) (Mr. Prashant B Chavadannavar, Bengaluru)
- ✦ Convenience flour from ragi suitable for stiff porridge (Mrs. Latha M R, Mysuru)
- ✦ Preparation of shelf stable roti from no wheat cereal and millet (Ragi, Rice, Maize, Jowar, Bajra) (Jawari Food Products Pvt.Ltd., Shiggoan)
- ✦ Tamarind juice concentrate (North Bastar Vanopaj Producer Company Ltd., Kanker)
- ✦ Fruit bar : Mango (Navkar Food Products, Tamilnadu)
- ✦ Fruit jams & jellies: preparation, Fruits & vegetables dehydration: Grapes, Banana (Mr. Marturi Ramakoteswararao, Secunderabad)
- ✦ Paan flavoured water (Purple Green Industries Pvt. Ltd., Kerala)
- ✦ Preparation of ready-to-use idly batter in retail packs

Short Term Training Programmes (July-Sep, 2023)

- ✦ Molecular Biology Tools and Techniques (July 25-28, 2023)
- ✦ Development of Pour Over Millet Beverage and Curd through Probiotic Bacteria (July 31-Aug 11, 2023)
- ✦ Baking Science and Technology (Aug 7-11, 2023)
- ✦ Electrical Safety in Food Processing Industry (Aug 16-18, 2023)

Skill Development Training Programmes

- ✦ The training programme on “Analytical Approaches to Current Food Safety Issues to Food Industry” was

(B.S VeenaMadhu, Ramanagara; Prisha Foods and Spices, Maharashtra; Chandan Enterprises, Tumkur; Mr. Abhijit Arvind Hingmire, Solapur; Mr.Vijaymahantesh S Mayannavar, Dharwad; Sangeetha Food Products, Hosur; Ananya Food Industry, Koppal; Mr. K. Ravichandran, Mettur; Mrs. P.Subhashini, Bengaluru; Mr. B Rajendra, Mysuru; Mr. J Sankar, Tamilnadu; G.C Foods Pvt. Ltd., Ghaziabad; Vadilal Industries Ltd., Ahmedabad; Mrs. E. Latha Bhaskar, Bengaluru; Mr. P S Maheswar Rao, Chennai; Dr. Giriappa Kollannavar, Bagalkot; Mrs. Dhole Sanskruthi Anil, Bhiwandi; Mr. Gurumurthy K N, Bengaluru; Mr. Joseph P Raphael, Bengaluru; Mr. Suresh Babu C, Mysuru; Girish Enterprises, Kolar; Mr. Rajkumar YV, Tamilnadu)

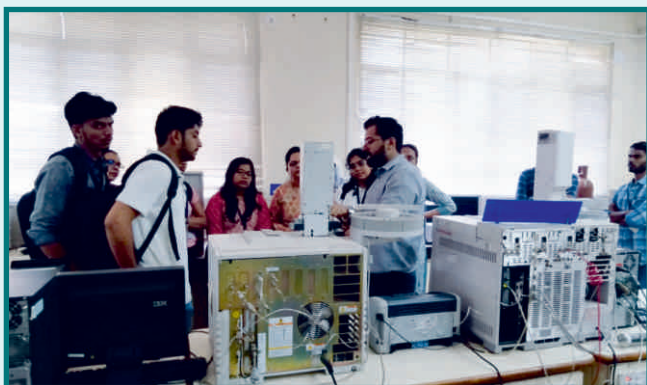
- ✦ All 6 variants of non-veg wafers (chicken, fish, egg, prawn, pork & meat) (RCR AQUA, Andhra Pradesh)
- ✦ Ginger paste, Garlic paste, Ginger beverage (Four-P International, Chennai)
- ✦ Pickles and chutneys: preparation (Maja Nature Foods, Bellary)
- ✦ Shelf stable jowar flour (Buhler (India) Pvt. Ltd., Bengaluru)
- ✦ Spirulina choco bar and cereal bar (Neweast Petrotech Projects Pvt. Ltd., Uttar Pradesh)
- ✦ Osmo-air dried: Mango (Deccan International Exports, Telangana)
- ✦ RTS Fruit juices and beverages (Trimadhura Foods & Beverages Pvt. Ltd., Mangaluru)

- ✦ Post- Harvest Technologies for Fruits and Vegetables (Aug 21-Sep 1, 2023)

- ✦ Grain Process and its Products for Health and Wellness (Sep 4-8, 2023)
- ✦ Chromatographic Techniques (GC, HPLC, UHPLC) and their Analytical Approaches in Food Analysis (Sep 11-15, 2023)

For details on short term courses visit website <https://stc.cftri.res.in> / contact by E-mail : stc@cftri.res.in

conducted during May 17-19, 2023. The focus of this programme was on current food safety issues in food industry. A total of 20 participants working in Food sector attended the training.



✦ The training programme on “Bakery Products Processing and Value Addition” for M/s Jalna Bakery Cluster, Jalna, Maharashtra was conducted during

June 14-15, 2023 which was attended by 20 participants.



Entrepreneurs' Desk

MMorphosis Pvt Ltd is a wellness company with the Vision and Mission in preventive health care segment, following on improving individual's health.

P V M Rich - Spirulina powder is rich in Proteins, Vitamins, Minerals has better digestibility (up to 95%) and better bioavailability as compared to many other synthetic supplements available in the market. There is a need to spread awareness about the contents of Spirulina and its enormous health benefits for a good market growth.

My sincere thanks to CSIR - CFTRI for providing technology for rural based biotechnological

production of Spirulina and support to start the work with proper training, develop and establish as a quality product in Indian market.

CSIR-CFTRI also helped us to expand business by connecting us with Industry experts, Government authorities and Public in various platforms including One Week One Lab (OWOL) programme.



Incubatee



At Progo Foods, our vision is to lead the food & beverage industry with a commitment to developing products

that are kind, ethical and sustainable to Earth and Every

Earthling! We will be initially launching a range of flavoured protein yogurt alternatives made from plants that offer 25g of Protein per 150g serving. Currently, being incubated at CFTRI, Mysuru, allows us to utilize the technical knowledge system, equipment and pilot plant that aids in our product development and scale-up trials. We are grateful for the support received from the incubation centre and hope more start-ups utilize such opportunities to their fullest.

Events

National Workshop (April 12-13, 2023)

Two-day National workshop on "Gerobiotics supplementation through millet beverage and

fermented millet curd" was organised in the campus by Microbiology & Fermentation Technology (MFT) department and sponsored by Probiotic Association of India (PAI) held during 12-13th April 2023. Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI inaugurated the event and various eminent speakers delivered talks on the above topic.



Dr. B R Ambedkar Birth Anniversary (April 14, 2023)

Floral tribute paid by Director, CSIR-CFTRI and staff to Bharat Ratna Dr. B. R. Ambedkar, architect of Indian Constitution on his 132nd birth anniversary on April 14, 2023.



National Technology Day (May 11, 2023)

National Technology Day celebration was held on 11th May, 2023. Shri D. Sudhanva, Co-Founder and CEO, Excel Soft Technologies Pvt. Ltd., Mysuru was the Chief Guest and delivered the National Technology Day lecture. He distributed Mementoes and certificates to entrepreneurs and released FoodPro, quarterly newsletter of CSIR-CFTRI (Jan-March 2023 issue). Dr. N.K. Rastogi, Chief Scientist and Director-in Charge presided over the function.



World Environment Day (June 5, 2023)

As part of World Environment Day celebration, tree planting ceremony was held on June 5, 2023 in CSIR-CFTRI campus. Shri Suresh Heblikar, Founder of Eco-Watch, Environmentalist, Film maker, Director & Actor was the Chief Guest and delivered Environment Day lecture. Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI presided over the function.



World Food Safety day (June 7, 2023)

World Food Safety day 2023 was observed at CSIR-CFTRI on 7th June 2023. Students from colleges in large numbers visited the Institute and have interacted with scientific staff of Food Safety and Analytical Quality Control Department (FSAQCL). Chemical, physical and biological hazards on foods were demonstrated.



Curtain Raiser of One Week One Lab (OWOL) (June 20, 2023)

The Curtain Raiser of One Week One Lab (OWOL) event was held at CSIR-CFTRI on 20th June, 2023. Dr. N. Kalaiselvi, Director General, CSIR & Secretary, DSIR unveiled the OWOL logo and released the brochure. Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI

welcomed the gathering and spoke about OWOL. The Chief Guest and dignitaries launched the Recruitment Software developed by CSIR-CFTRI. Director General, CSIR also visited various facilities, products display and posters venues and interacted with scientists.



International Yoga Day (June 21, 2023)

International Yoga Day 2023 with theme “Yoga for Vasudhaiva Kutumbakam” was celebrated on June 21, 2023 at CSIR-CFTRI Campus. Director, CSIR-CFTRI, staff and students participated in the event.



Visitor(s) to CSIR-CFTRI

- ✦ Dr. A.K. Shasany, Director, CSIR-NBRI, Lucknow along with team visited CSIR-CFTRI on 8th May, 2023 and interacted with Director, CSIR-CFTRI and scientific staff on value addition and increasing vase life of flowers.
- ✦ A group of ASC Senior Officers (ASMAFT-16) from ASC Centre & College, Bengaluru visited CSIR-CFTRI and its facilities on 16th May, 2023.
- ✦ Trainees of Motor Vehicle Inspectors visited CSIR-CFTRI on 5th June, 2023 to see the facilities in the Institute and interacted with scientists as part of the programme organised by Karnataka Police Academy, Mysuru.
- ✦ High level delegates of Government of Chhattisgarh visited CSIR-CFTRI on June 16, 2023 to understand



millets cultivation and processing, minor forest produce collection and processing along with the promotion of horticulture crop etc. Team of delegates led by Mr. Pradeep Sharma, Advisor to Hon'ble Chief Minister, Chhattisgarh & Dr. Kamal Preet Singh, Agriculture Production Commissioner and others visited the facilities of the Institute.

- ✦ Delegation from National Commission for Scheduled Castes (NCSC) led by Ms. Anju Bala, Former Member of Parliament and Member NCSC visited CSIR-



CFTRI on June 16, 2023 to overview welfare activities of SC/ST staff at CSIR-CFTRI. The team also visited the CSIR-CFTRI showcase & interacted with scientific staff.

- ✦ Taiwan Delegation consisting of Mr. Wanh Yun-Chieh, Economic Secretary, Economic Division, Taipei Economic and Cultural Centre in India, Ms. YiChun TU and Ms. Jessi Fu of Industrial Technology

Research Institute (ITRI), Taiwan visited the Institute on 19th June, 2023 and interacted with Scientists regarding possibilities of collaboration between CSIR-CFTRI and Food Industry Research and Development Institute (FIRDI), Taiwan on food processing technology, capacity building, technology transfer etc.



Institute Seminars

- ★ Prof. S. Hiriyanra, Retired Senior Scientist, Indian Space Research Organisation (ISRO), Bengaluru delivered the talk entitled "Learning of Life Lessons: What our Organization Teaches Us?" on 3rd April, 2023.

- ★ Dr. Rupal Dalal, Professor, Indian Institute of Technology, Mumbai and Member, Research Council of CSIR-CFTRI delivered the talk entitled "The Hope for Healthy Ageing through Nutrition & Lifecycle Approach" on 10th April, 2023.

Team CSIR-CFTRI Achievement in Sports

CSIR-CFTRI team comprising Mr. R. N. Ramesh (Captain), Dr. Arun Panneerselvam, Mr. Girish K. Ghiwari & Mr. M. Shivakumara won the **Thacker Memorial Lawn Tennis Team Championship** among CSIR labs held at CSIR-NIIST, Thiruvananthapuram between May 19-23, 2023. Mr. R. N. Ramesh won the Singles Championship.



Selected Publications

- ★ Sunagar R.R., Sreerama Y.N., Implication of solvent polarities on browntop millet (*Urochloa ramosa*) phenolic antioxidants and their ability to protect oxidative DNA damage and inhibit α -amylase and α -glucosidase enzymes, *Food Chem.*, 2023, 411, art. no. 135474. (IF: 8.8)
- ★ Mekala K.P.R., Dinesan A., Serva Peddha M., Dhale M.A., Valorization of biowastes as fermentative substrate for production of *Exiguobacterium* sp. GM010 pigment and toxicity effect in rats, *Food Chem.*, 2023, 407, art. no. 135131. (IF: 8.8)

- ★ Rachitha P., Krupashree K., Brindhadevi K., Pal A., Chinnathambi A., Alahmadi T.A., Shanmuganathan R., Karuppusamy I., Raghavendra V.B., Convalescent action of menthol against T-2 mycotoxin-induced toxicity: An in vitro study with HaCaT cells, *Environ. Res.*, 2023, 227, art. no. 115690. (IF: 8.3)
- ★ Toragall V., Muzaffar J.C., Baskaran V., Lutein loaded double-layered polymer nanocarrier modulate H₂O₂ and CoCl₂ induced oxidative and hypoxia damage and angiogenic markers in ARPE-19 cells, *Int. J. Biol. Macromol.*, 2023, 240, art. no. 124378. (IF: 8.2)

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