

# FoodPro

July-Sep 2021



Interaction with Scientists at Food Engg. Centre



Hon'ble Minister at Farmer's Processing Centre



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## Research Highlights

### Blackgram by-product as a new texturized vegetable protein

The by-product derived from black gram milling is a valuable source of proteins and dietary fibers. Currently it has a very low value in the market and mainly used as a livestock feed. The by-product can be processed further to obtain useful ingredient for a diverse range of food applications. Extrusion cooking was used to texturize this by-product. As a result, the extruded by-product exhibited appreciable water absorption capacity which increased from 2.85 to 3.61 g/g while, starch digestibility increased from 72.88% to 78.83%. The oil absorption capacity and emulsion capacity was similar to the commercial soy based texturized vegetable protein (TVP). The process successfully reduced the level of antinutrients like proanthocyanidins from 12.93 to 9.7 mg/g and saponins from 31.35 to 22.02 mg/g which in turn enhanced the nutritive value of the extrudate. Further, the suitability of the extruded by-product as a meat replacer in patty formulation revealed that it has good textural and sensorial acceptability. Therefore, an inexpensive by-product source from pulse milling can be texturised and has the potential to be used as a meat substitute. The study provides a new avenue for food processors seeking an efficient way to add value to their edible residual by-products.

(Source: Kamani, M.H., Luithui, Y., Meera, M.S., *Upgrading Black Gram By-Product to a New Texturized Vegetable Source by Extrusion: Evaluation of Functionality, Antinutrients and In Vitro Digestibility, Waste Biomass Valor*, 2021, 12, pp.4319–4330)

### Calcium hydroxide extractable polysaccharides isolated from bran, spent grain and sorghum grains

Sorghum bran (SB) and sorghum wasted grain (SG) are the raw materials rich in bioactive components such as polyphenols and dietary fibres (DF). SB and SSG are the main processing wastes discarded after obtaining sorghum flour and sorghum beer respectively. SB and SSG are low-cost sources of DF, particularly non-starch polysaccharides (NSP), which can be used in the preparations of functional foods. Arabinoxylans (AX) are the most important NSP (70%) found in grains such as wheat, rice, maize, ragi and sorghum, and there is growing interest in their use in the food industry with respect to their functionality and nutritional attributes. No research has been done on the structural features of AX extracted from sorghum by-products (bran and discarded grain). The calcium hydroxide extractable polysaccharides isolated from bran, spent grain and sorghum grains were separated on diethylaminoethyl-cellulose column into five sub-fractions each, by eluting successively with different eluents. These fractions differed in their yield, uronic acid contents and composition of neutral sugars as well as phenolic acids. The major fraction (0.1 M ammonium carbonate eluted) was resolved into a single peak each on Sephacryl S-400 and their homogeneity was ascertained by High Performance Size Exclusion Chromatography. Ferulic acid was the major phenolic acid (19.84–29.32 mg/100 g) bound to arabinoxylan-(AX). The molecular weights of AX were found to be 126.6 kDa for bran and spent grain, and 223.9 kDa for sorghum grains. The structural

characterization of the purified polysaccharides, carried out by <sup>13</sup>C NMR, <sup>1</sup>H NMR, FTIR, periodate oxidation, Smith degradation and optical rotation analysis, indicated their backbone to be 1,4-β-D-xylan (optical rotation ranged from – 4.0 to – 7.8), substituted mainly at O-2 or O-3 and/or both by α-L-arabinose residues. As evident from the determination of colour characteristics and high thermostability (T<sub>0</sub> > 200 °C),

these polysaccharides can be used in the preparation of fibre-rich foods including bakery products.

(Source: Takoudjou Miafo, A. P., Muralikrishna, G., Koubala, B.B., Kansci, G., Purification and structural characterization of calcium hydroxide isolated arabinoxylans derived from bran, spent grain and sorghum grains, *J. Cereal Sci.*, 2021, 100, 103266)

## IPR in the Horizon

### A device for washing fruits and vegetable at domestic scale

The present invention relates to a device for washing of fruits and vegetables on a domestic scale. The device

comprises concentric basket, AC induction relay based bidirectional motor, Ozone purification kit, driving system etc. wherein the concentric basket is having stationary and rotary baskets. Further, the capacity of the device is 500gm/batch, total cycle time per batch is 360 secs and provides 90-100 percent protection from pesticides, dust and other foreign particles.

## New Technologies

### Nutri Fruit bars with immune boosters

Nutri fruit bars are made from different fruits such as mango, banana, papaya, guava, apple and also blending different fruit pulps. Nutri fruit bars fortified with essential micronutrients provides a food delivery system which is convenient and nutrient dense. Micronutrients such as Vitamin C and Zinc are important micronutrients attributed with immune boosting properties. Nutri fruit bars with the micronutrients were developed from mango, mixed fruit (banana, pineapple, grapes, and papaya). The technology facilitates the manufacture of the product under controlled conditions. Nutri fruit bars can be consumed as a snack product and also as a concentrated source of energy in special rations designed for mid-day meal, expeditions and defense personnel.

### Coconut protein powder

A by-product of virgin coconut oil, coconut proteins has been gaining popularity. Coconut protein does not possess a beany flavour like soy and pea proteins but exhibit flavour properties which are generally acceptable to most of the people. Coconut protein powder (CPP) is a value-added spray dried product prepared by mixing and homogenization of coconut skim milk (essentially an aqueous phase) and insoluble protein (solid phase), which are the byproducts of wet processing method of virgin coconut oil. Coconut protein, besides being highly nutritious, has excellent functional properties such as foaming and emulsifying capacities. Two principal protein fractions are obtained during wet processing for virgin coconut oil production. The first one is the coconut skim milk which contains

70 % of the total protein and the second one being the insoluble protein or “protein solid” containing 21 % of the total protein. In general, the coconut proteins are rich in glutamic acid (22–27%), arginine (12–16%), and aspartic acid (8–10%). This product has the potential to replace milk powder, whey powder, other protein powders and also as a standalone product for specialty foods. It possesses excellent functional properties such as water holding capacity, fat absorption and emulsifying properties can be of value when incorporating proteins in mixed systems. It can be used to replace the traditional protein component while formulating protein enriched foods. Published reports show that coconut protein could be used, along with coconut fat, to prepare highly acceptable and relatively inexpensive new types of dairy-like foods. The presence of different proteins and amino acids makes it a ‘functional food,’ which is known to have anti-cardiovascular, anti-diabetic, antibacterial, antiviral and antifungal activity. The product is very new in the Indian market and has a good potential for export. The product has a very wide range of application in food and pharmaceutical industry.



## Technologies Transferred

- ✦ Tomato products: preparation (Synchro Pack Ltd., Kolkata)
- ✦ Improved process for preservation of Neera, Neera concentrate (Deeja Agro Processed Foods Pvt. Ltd., Bengaluru)
- ✦ Tamarind candy (AH Naturals, Kerala)
- ✦ Eggless cake premix (Mr. Gordhan Motwani, Madhya Pradesh)
- ✦ Preparation of shelf stable roti from non-wheat cereal and millet (Nidhi Food Products, Dakshina Kannada)
- ✦ Process for the preparation of gluten free bakery products (Kanti Sweets, Bengaluru)
- ✦ Raw banana powder, Osmo-air dried fruits (Amla, Jackfruit, Pineapple & Mango) (Abhay Natural Food Processing Unit, Mysuru)
- ✦ Bio preservation of RTE sugarcane chunks (Celebrating Farmers Edge International Pvt. Ltd., Maharashtra)
- ✦ Herbal fogging disinfectants for mist sanitizer system (Nontoxic.in, Kerala)
- ✦ Sugar free biscuits, Sugar free cup cake, Sugar free cake rusk, Coffee concentrate, Tomato product: preparation, Potato wafers/chips, Fortified mango bar, Pickles and chutneys preparation, Prawn pickle, Mutton pickle, Meat pickle, Instant coffee cubes, Sugarcane juice spread (State Mission Management Unit, Aizwal)
- ✦ Ginger beverage, Tomato product: preparation, Paan flavoured water (3 D Nutriants, Madhya Pradesh)
- ✦ High protein biscuits, High protein rusk (Assocom Foods Pvt. Ltd., Uttar Pradesh)
- ✦ Shelf stable chapatis (Mr. B Adithya Rao, Telangana)
- ✦ Paan flavoured water (Mr. Sai Sarvesh, Chennai)
- ✦ Annatto dye: preparation (Lalitha Enterprises, Hyderabad)
- ✦ Osmo-air dried fruits(Amla) (Mr. Vaitheeswaran, Tamilnadu)
- ✦ Deep fat fried and flavoured cashew kernels (Allianz Nut Foods Pvt. Ltd., Kollam)
- ✦ Desiccated coconut (L-mate Groups, Mandya)
- ✦ Malted weaning food (Mr. Gyanendra Kumar, Mysuru)
- ✦ Process for the preparation of raw banana powder (unripe) (Mr. Venkat Goluguri, Hyderabad)
- ✦ Herbal fogging disinfectants for mist sanitizer system (Shizen Bio, Andhra Pradesh)
- ✦ Osmo-air dried fruits (Amla, Jackfruit, Pineapple & Mango) (Directorate of Food Processing, Govt of Meghalaya)
- ✦ Process for flavour essence from Decalepis (Lalitha gardens, Ballary)
- ✦ Layered parotta (South Indian) (South Indian fresh foods Pvt. Ltd., Bengaluru; A1 Home Made Food Products, Mysuru)
- ✦ Sugar free cup cake (Mr. Munneshwar Baburao Bahadure, Maharashtra)
- ✦ Shelf stable roti from non-wheat cereal & millet (Nova Web Innovations Pvt. Ltd., Hyderabad)
- ✦ Plant growth promoter: containing triacontanol (Linga Chemicals, Tamilnadu)
- ✦ Water soluble turmeric colourant (odourless) (Anthocyanin Naturals India Pvt. Ltd., Kerala)
- ✦ Spice oleoresin turmeric; Spice oleoresin enriched (Angami Foods Pvt. Ltd., Navi Mumbai)
- ✦ Instant products form moringa leaves (Sri Nanjundeshwara hp gas Grameen Vitrak, Tumkur)
- ✦ Roasted and flavoured cashew kernels (TSS Ltd., Sirsi)

## Entrepreneurs Speak..



State Urban Development Agency (SUDA) functioning under the aegis of Housing & Urban Development Dept., Govt. of Odisha is promoting Mission Shakti Women Self Help Group (WSHG's)

to take up entrepreneurial activities on a large scale. In the above context, three Pickle making units with a capacity of 120 MT /annum per Unit were established at Berhampur, Dhenkanal and Baripada districts. These units will be supplying pickle to State Aahaar Programme, a popular programme in the State of Odisha, which provides lunch and dinner to the needy people @ Rs 5/ meal. They will be supplying 300 MT of pickle per annum to this programme. These units have been registered under Society Act, 1860.

## Product ranges & brand

Two units have started the production of pickle from July 2021 onwards and 5 kg pet jar is being supplied to Aahaar Programme. It is also planned to pack the pickle in small jars i.e. 250 gm, 500 gm and 1 kg etc. for open market as well.

## Vision & challenges

Each of these units has set a target to produce 150 MT of pickle per annum which would help in augmenting the income of women entrepreneurs up to Rs.15000/- per month. These units are aiming to produce chutney from 2nd year onwards. Marketing is one of the biggest challenges, as Women Entrepreneurs are involved in this programme, with limited knowledge on market dynamics.

## New Collaborations

### ICAR-Indian Institute of Millets Research (ICAR-IIMR), Hyderabad (July 8, 2021)

The goal is to collaborate on the development of processing machinery, value-added products, shelf-life extension, and nutrition profiling of millet cultivars to explore the export potential of millet based products.

### Spirulina Foundation, Tumkur (July 23, 2021)

A joint project on nutrition intervention for 136 severely acute malnourished (SAM) children in Mysore District will be taken up as part of this programme.

### Ozone Research & Applications (I) Pvt. Ltd., (ORAIP), Nagpur (July 28, 2021)

A collaborative project on the development of ozone systems for iron removal from water, aflatoxin and bacterial mitigation in food grains, flours, and spices has been undertaken under this initiative.

### Indian Institute of Management Nagpur Foundation for Entrepreneurship Development (InFED, IIMN), Nagpur (Aug 5, 2021)

CSIR-CFTRI and InFED, IIMN signed a MoU to promote interaction between faculty and students from both organizations by organizing joint conferences, seminars, and mentoring of start-ups.

### Ministry of Rural Development (MoRD), New Delhi (Aug 9, 2021)

MoRD in association of CSIR-CFTRI aims to provide technical support for the range of interventions in the

## Role of CFTRI in catalysing growth of your firm

The women entrepreneurs involved in the programme are completely novice in pickle making. The practical training from CSIR-CFTRI provided them the much-needed confidence to kickstart this activity at the scale with ease. Support extended by CSIR-CFTRI was quite encouraging and handy for the women entrepreneurs. They acquired the requisite skills and techniques to produce quality products.

## Your advice to emerging start-ups

We would like to encourage the start-ups to visit CFTRI, Mysuru campus and learn innovative things on food technology which in turn would be quite helpful in streamlining production process. Application of appropriate technology and mentoring would be able to resolve initial hiccups which do come in the way of setting up of units.

food processing sector. The support will be provided to the MoRD or to any of the SRLMs implementing any program of MoRD.

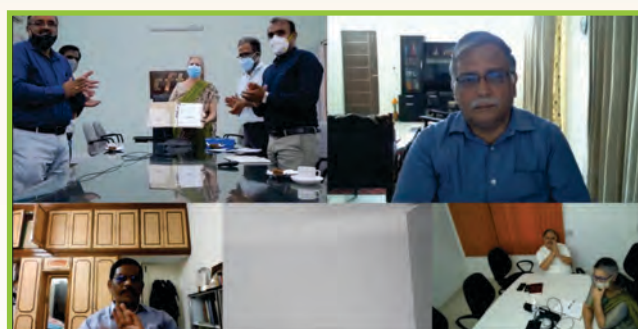
### Createcomm Tech Pvt. Ltd., Gurugram (Aug 17, 2021)

Under this agreement, a collaborative project on development of thermostable container for perishable food items has been undertaken under this initiative.



### Prakhoj Pvt. Ltd., Bengaluru (Aug 24, 2021)

Both the organizations signed an agreement to assess the commercial feasibility of the technology to extract soluble and insoluble arabinoxylan-rich products from wheat bran.



## Events

### Phenome India - PAN-CSIR study (July 7-9 & Aug 9, 2021)

The Phase-III Phenome-India PAN-CSIR study was held in the campus for Staff, students and family members to determine antibody prevalence and stability.

### Training of Master Trainees on Grain Processing (Aug 3-6, 2021)

Webinar on “Training of Master Trainees on Grain Processing” under PMFME was held during Aug 3-6, 2021. A total of 12 representatives from 09 states attended.



### Launch of FUELVOLT Website (Aug 6, 2021)

Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI, launched the FuelVolt website of a start-up firm housed at Accelerator facility focusing on Sports Nutrition. FuelVolt is a signature Diet & Nutrition program developed by Athlebit Healthcare in collaboration with prominent sports nutritionists to equip athletes of all levels with holistic, accurate diet and nutrition solutions. It is planned to create dietary plans specifically for Juniors, Adolescents, Adults, Masters, and Para Athletes. The organization also offers dietary advice during the off-season, pre-season, season, competition, and even during an injured layoff. Golz, Thyrocare, and InBody Inc. have all partnered with the company.



### National Student Outreach Programme (Aug 6, 2021)

NCERT, CSIR, and CSIR-CFTRI hosted a Webinar on “How human are we? Our microbiome, Nutrition and Long-term health” as part of the Pravasi Bharathiya Academic and Scientific Sampark (PRABHASS) National Student Outreach Program in a virtual meet.

### Digital Signature & Public Key Infrastructure Awareness Workshop (Aug 31, 2021)

A workshop was held in which Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI, and Dr. S.D. Sudarshan, Executive Director, C-DAC were present. Staff from C-DAC gave lectures on Digital Signature & Public Key infrastructure, E-sign: online Digital Signing Service and Demo of Digital signing. About 50 staff participated in the above workshop.



### Independence Day Celebrations (Aug 15, 2021)

Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI, hoisted the national flag as part of the Independence Day celebrations and delivered Independence speech. This event was also covered on the Virtual platform.



## Integrated CSIR Skill Initiative (Aug 17-18, 2021)

Webinar on "Food Processing Machineries & Unit Operations" was held during Aug 17-18, 2021 conducted by CSIR-CFTRI under Integrated CSIR Skill Initiative. The programme was inaugurated by Ms Vinoth Priya, IAS, Director, MSME, Dept. of Industries & Commerce, Govt. of Karnataka and Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI presided and various talks were delivered by Scientific staff. About 196 participants attended the above training programme through Virtual platform.

## Curtain Raiser of 28th ICFOST (Aug 27, 2021)

Association of Food Scientists & Technologists (AFSTI) India, organized Memorial Lectures and Curtain Raiser of 28th ICFOST event in association with CSIR-CFTRI and DRDO-DFRL. Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI delivered H.A.B. Parpia Memorial Lecture and Dr. R. Kumar, Associate Director, DRDO-DFRL delivered Sri G. C. P. Rangarao Memorial lecture on the occasion.

## Director General - CSIR Visit CSIR-CFTRI (Sep 6, 2021)

Dr. Shekhar C. Mande, Director General, CSIR, New Delhi, Govt. of India, launched the IIMR-CFTRI-APEDA Multi-Institutional Project on Millets in the presence of Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI. He also interacted with CSIR-CFTRI Young Scientists, Students, and Research Fellows. Further, flavoured water, a technology developed by the Institute was launched on the occasion. Dr. Mande also interacted with CSIR-CFTRI School children as part of the National Nutrition week.



## Azadi ka Amrit Mahotsav Celebrations (Sep 7, 2021)

A webinar on "Millet Processing & Value Addition Avenues" was conducted and inaugurated by Dr. Shekar C. Mande, Director General CSIR, New

Delhi as part of the Azadi ka Amrit Mahotsav. Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI presided. Dr. Geethavani Rayasam, Senior Principal Scientist, CSIR Hqrs gave opening remarks and scientists from CSIR-CFTRI and ICAR Institutes delivered lectures.



## Engineer's Day celebrations (Sep 15, 2021)

54th Engineer's Day celebrations was held on Sep 15, 2021 on the occasion of 161st Birthday of Bharat Ratna Sir M. Visvesvaraya wherein Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI presided and garlanded the photo and addressed the gathering.



## CSIR Foundation Day Celebrations (Sep 26, 2021)

The Chief Guest, Dr. Nagahanumaiah, Director, Central Manufacturing Technology Institute (CMTI), Bengaluru delivered the CSIR Foundation Day lecture on "4Ps: Challenges in Inclusive Innovation Process". Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI presided.



## Webinar on “Innovative & Healthy Snacks” (Sep 28-29, 2021)

CSIR-CFTRI conducted a webinar on "Innovative & Healthy Snacks" as part of the Integrated CSIR Skill Initiative. The programme was inaugurated by Dr. R K Sinha, Head, CSIR-Human Resource Development Centre, Ghaziabad and Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI presided the event. About 75 participants attended the above training programme.



## Visit of Delegations

- ✦ Dr. Narendra Mohan, Director, National Sugar Institute (NSI), Kanpur visited CSIR-CFTRI on Aug 23, 2021 and interacted with scientists for undertaking collaborative projects in the area of Sugar sector.
- ✦ Dr. Babulal, Director, Central Sericulture Research & Training Institute (CSRTI), Mysore visited the Incubation Centre (NPIC-CIF) on Sep 8, 2021 and interacted with Startups.
- ✦ Shri Giriraj Singh, Hon'ble Union Minister for Rural Development & Panchayat Raj, Govt. of India visited CSIR-CFTRI on Sep 24, 2021. The Hon'ble Minister interacted with CSIR-CFTRI scientists on

ongoing R&D programme pertaining to Rural Technologies. An MoU was signed between CSIR-CFTRI & MoRD. A compendium on Rural Technologies was released on the occasion. The Hon'ble Minister also visited Farmers Processing Centre during the visit.



## Selected Publications

- ✦ Sapna, I., Jayadeep, A., Influence of enzyme concentrations in enzymatic bioprocessing of red rice bran: A detailed study on nutraceutical compositions, antioxidant and human LDL oxidation inhibition properties, *Food Chem.*, 2021, 351, art. no. 129272. (IF: 7.514)
- ✦ Nagaraju, P.G., Sindhu, P., Dubey, T., Chinnathambi, S., Poornima Priyadarshini, C.G., Rao, P.J., Influence of sodium caseinate, maltodextrin, pectin and their Maillard conjugate on the stability, in vitro release, anti-oxidant property and cell viability of eugenol-olive oil nanoemulsions, *Int. J. Biol. Macromol.*, 2021, 183, pp. 158-170. (IF: 6.953)
- ✦ Noore, S., Ramesh, G., Vendan, S.E., Nagaraju, V.D., Persistence and diffusion behaviour of chlorpyrifos in five different species of vegetables: A comparative analysis, *Ecotoxicol. Environ. Saf.*, 2021, 217, art. no. 112208. (IF: 6.291)
- ✦ Penta, D., Mondal, P., Natesh, J., Meeran, S.M., Dietary bioactive diindolylmethane enhances the therapeutic efficacy of centchroman in breast cancer cells by regulating ABCB1/P-gp efflux transporter, *J. Nutr. Biochem.*, 2021, 94, art. no. 108749. (IF: 6.048)

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