

FoodPro

July - September, 2022

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



CSIR-CFTRI Open Day



CSIR-CFTRI Open Day



ಸಿ.ಎಸ್.ಐ.ಆರ್.-ಕೇಂದ್ರೀಯ ಆಹಾರ ತಾಂತ್ರಿಕ ಸಂಶೋಧನಾಲಯ, ಮೈಸೂರು
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Research Highlights

N-glycoprofiling of two major glycoproteins from goat milk

Goat milk has certain nutritional and therapeutic properties and because of which it is considered as a suitable replacement for bovine milk. Some unique features of goat milk include lower lactose content and higher free oligosaccharides (FOS) concentration compared to bovine milk. A few FOS present in goat milk are structurally similar to human milk oligosaccharides and have shown anti-adhesive, anti-pathogenic and prebiotic potential. In addition to FOS, the *N*- and *O*-glycans (bound sugars) present in glycoproteins and glycolipids also contribute to the carbohydrate pool of the milk. The bound sugars are structurally diverse and are also capable to exhibit similar biofunctionalities as FOS. Compared to human and cow milk, the diversity of *N*-glycans of many glycoproteins in goat milk are not extensively characterized. In the present study, liquid chromatography coupled to mass spectrometry (UHPLC-MS/MS) was employed to delineate the glycan pattern of two major glycoproteins-immunoglobulins G (IgG) and lactoferrin (Lf) from goat milk. IgG contains complex type glycans that are biantennary type with differential core fucosylation, bisecting GlcNAc and mono/di-sialylation (NeuAc/NeuGc). *N*-glycan repertoire of Lf indicated the range of high mannose, complex and hybrid types. The analysis revealed that even though the glycan features observed in these glycoproteins were in part comparable to bovine milk, the glycan composition and their abundances were found to be species-specific. Further investigation is warranted

for the effective utilization of these glycoproteins as bioactive ingredients.

(Gnanesh Kumar, B.S., Lijina, P., Jinesh, P., Anagha, S.M. *N-Glycoprofiling of immunoglobulin G and lactoferrin with site-specificity from goat milk using RP-UHPLC MS/MS, Food Chemistry, 2022, Volume 383, art.no.132376*)

Novel coffee processing method by Honey/pulped natural coffee (HC) technique

Coffee production involves a series of processing stages, starting with the harvest of ripe coffee cherries, post-harvest handling, drying and roasting of beans. Various processing methods induce diverse metabolic reactions in coffee beans, which can affect the chemical composition and cupping quality of the final product. Honey/pulped natural coffee (HC) process combines fermentation and drying excluding the washing stage thus conserving water, unlike wet method. Robusta coffee (*Coffea canephora*) mucilage was monitored for the evolution of bacterial and fungal diversity along with metabolites produced. Lactic acid bacteria (48%) and the major fungal community of *Wallemia* (31%), a selective marker of Robusta coffee fermentation, were predominant throughout the processing. The process modulates volatiles without significantly affecting the total polyphenols (4.66%), chlorogenic acid (2.07%), caffeine (1.66%), trigonelline (0.53%) and theophylline (0.16%). HC contained compounds like 2-methoxy-4-vinyl phenol, 2-furancarboxaldehyde, 5-methyl-, acetic acid, pyrazine, methyl-, 2-propanone, 1-hydroxy-, and furfural that promotes sweet, caramelly, nutty, pungent and hazelnut taste to coffee. This work reports for the first time the HC

microbial genomics, kinetics, substrate consumption and metabolites which are the chief factors in monitoring and establishing fermentation matrix and modulation of the quality characteristics. This technique could be established and adapted by the coffee growers to yield a differentiated coffee that can compete for a better premium. Perhaps the water conservation or water stored for not washing the

coffee will contribute as a boon for pollution abatement in coffee estates.

(Aswathi, K. N., Shankara, S. R., Keerthana Sreenivasan, Inderjit Prakash, Pushpa S. Murthy *Metagenomics and metabolomic profiles of Coffeacaneophora processed by honey/pulped natural technique, Innovative, Food Science & Emerging Technologies*, 2022, Volume 79, art.no.103058)

New Technologies

SeaSlim: Anti-obese beverage mix based on Indian brown seaweed and cereal

The high prevalence of obesity worldwide has triggered the global market for anti-obesity drugs and adjunct therapies comprising food formulations that can address obesity. Often, the side effects due to clinical intervention therapies is another reason for the increased demand for the anti-obesity food formulation. The oceans of Indian subcontinent provide ample supply of brown seaweed (*Padinatetrastromatica*) rich in bioactive principals including fucoxanthin, linolenic acid (n-3), fucoidan and laminaran with known metabolic regulatory properties. However, there are insufficient data to project *Padinatetrastromatica* as a potential anti-obesity supplement. In this research project, the bioactive fucoxanthin (known for thermogenesis), PUFA rich fat and polysaccharides (fucoidans and laminaran) from Indian brown seaweed were isolated and elucidated for their anti-obesity potency in animals. The cereal (barley) and seaweed blended dietary supplement was formulated and studied for its potential anti-obesity activity in high-fat fed mice model. The data suggested that SeaSlim product significantly lowered body weight and blood lipids compared to control. The increased elimination of lipid in feces demonstrated dampened intestinal lipids absorption as possible reason for reduction in the blood lipids. The molecular markers of adipogenesis comprising PPAR- γ was found to be downregulated, whereas, the thermogenesis marker including UCP-1 was found to be upregulated. In conclusion, the SeaSlim prepared using cereal and brown sea weed exhibited anti-obesity properties with low-glycemic index. The sensory studies revealed overall acceptability for the product. The total absence of

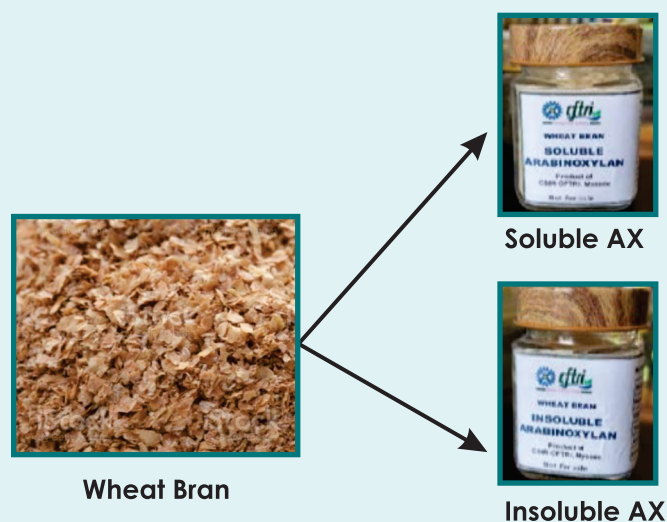
heavy metals (lead, mercury, arsenic etc.) and rich presence of minerals (iron, iodine, magnesium etc.) makes SeaSlim safe and promising.



Process for the production of soluble and insoluble arabinoxylan from wheat bran

Arabinoxylan (AX) is one of the important dietary fibers found in cereal bran. Several scientific reports clearly demonstrated its benefits to human health. AXs are an important group of non-starch polysaccharides preponderantly present in cereal and millet brans. They are highly branched and composed of β -1,4 linked D-xylopyranose backbone with arabinose in the side chain (Muralikrishna and Subba Rao, 2007). Arabinoxylan is known to have several biological activities, such as antioxidant activity, prebiotic, cholesterol-lowering, blood sugar modifier and immunity enhancer. Wheat bran, the major processing by-product of the wheat milling industry, is a mixture of abundant nutrients and bioactive components including protein (12–16%), starch (10–18%), lignin (4–8%) and dietary fiber (36–52%). The main hemicellulose component in wheat bran is AX, accounting for ~26 (%db) in dry weight. A cost-effective process to extract soluble and insoluble AX from wheat bran has been developed. The current process is greener and does not require any specialized equipment. The safety of the product

has been studied as per the OECD423 guidelines and the NOAEL level was 2g/kg BW. Different functional food products developed by incorporating soluble and insoluble AX were found to be highly acceptable. AX finds application in several food products, beverages, pharmaceuticals and animal nutrition. Wheat bran AX was given GRAS status by FDA (21CFR 101.12) in 2014 and European Food Safety Authority (EFSA) approval in 2011. Both the products produced in the current process have more than 65% AX by dry weight. The dietary fiber market is growing at 12.5% CAGR and has vast applications in different fields. The technology is ready for commercialization.



Technologies Transferred

- ✦ Online fortification of atta/maida (Sanwaria Sweets Pvt Ltd., Rajasthan)
- ✦ RTS Fruit juices and beverages (Mr. Ajit Keshav Bhovi, Belagavi)
- ✦ Multigrain cereal legume bar & puffed rice bar (Food Grah Pvt Ltd., Raichur)
- ✦ Preparation of shelf stable biriyani paste (Curry Factory, Coimbatore)
- ✦ RTS Fruit juices and beverages, Nutri fruit bars with immune boosters (Ingex lab Pvt Ltd., Bengaluru)
- ✦ Moringa Chikki, Dehydrated drumstick powder, Instant moringa leaf based products, Low fat expanded green snack using moringa, Fruit syrups and squashes, Bar cake (Prof. Pradeep Kumar Naik, Dept. of Biotechnology and Bioinformatics, Sambalpur university)
- ✦ Ready mix: Vada, Instant idly mix (CNERG Foods Pvt Ltd., Mysuru)
- ✦ Shelf-stable varieties of curry pastes for vegetarian & non-vegetarian traditional cuisines (Chicken curry, Mutton curry, Butter chicken, Shahi Paneer, PindiChanna, Sambar (without coconut), Dal Tadka, Kitchen King, Preparation of shelf stable biriyani paste, Spice mix: Pulioagre) (Mahashian Di Hatti Pvt Ltd., Haryana)
- ✦ Instant traditional foods: Sambar (Ms. Rupinder Kaur, Barnala)
- ✦ Jamunfruit products (Squash, RTS beverage, Syrup) (Jovaki Agrofood India Pvt Ltd., Rajasthan)
- ✦ Nutra chikki with added spirulina (Durga SHG, Dist- Sundargarh)
- ✦ Nutra chikki with added spirulina (MAA Santoshi SHG, Dist- Sundargarh)
- ✦ Nutra chikki with added spirulina (Anupama PG, Dist- Sundargarh)
- ✦ Nutra chikki with added spirulina (MAA Tarini SHG Golghar Rourkela, Dist- Sundargarh)
- ✦ Nutra chikki with added spirulina (MAA Laxmi PG, Rangadhipa, Sundargarh)
- ✦ Rural based biotechnological production of spirulina (Krishi Vigyan Kendra, Dist- Sundargarh)
- ✦ Rural based biotechnological production of spirulina (Adhvanika Agrotech Pvt Ltd., Mumbai)
- ✦ Energy Food: New formulation (Aasray Foods Pvt Ltd., Dist. Kamrup)
- ✦ Multigrain pasta, Low Glycemic Index Noodles (Raj Krishna Foods, Tamilnadu)
- ✦ Layered parotta (South Indian) (Mr. Vijaymahantesh Mayannavar, Dharwad)

- ✦ Spice mix: Puliogre (Pure Fit Foods Pvt Ltd., Mandya)
- ✦ Ready mix: Dosa, Ready mix: Upma, Instant idly mix (Mr. Darshan S, Hosadurga)
- ✦ Roasted and flavoured cashew kernels (Hilltop Enterprises, Kerala)
- ✦ Chikki / Nutrachikki (3 formulations) (Mysore Organic Tree, Mysuru)
- ✦ Fruit bar: Apple, Banana, Guava, Mango, Improved Banana Fruit bar, Osmo-air dried fruits (Amla, Jackfruit, Pineapple) (Kakkoor Service Co-operative Bank Ltd., Kerala)
- ✦ Pulse based papads (Mr. Mahesh Mohan Pawar, Thane)

Short-term courses (Sep-Nov, 2022)

- ✦ Fundamentals of food analysis for process hygiene and microbial food safety criteria (Sep 5-9, 2022)

- ✦ Food colours: Chemistry, analysis and technologies (Sep 12-16, 2022)
- ✦ Advanced analytical tools in Microbiology (Sep 26-30, 2022)
- ✦ Paddy & rice processing and products (Oct 10-14, 2022)
- ✦ Analytical approaches to current food safety issues in food industry (Oct 17-21, 2022)
- ✦ Sensory analysis an approach towards consumer preference (Nov 9-11, 2022)
- ✦ Wine fermentation (Nov 14-18, 2022)
- ✦ Grain process & products for health & wellness (Nov 21-25, 2022)
- ✦ Strategies for probiotic dairy product development (Nov 28-30, 2022)

Entrepreneurs Speak...

plantishTM

Plantish is building a future-ready healthy, safe & sustainable food system without disturbing people's eating habits. Plantish uses underutilised plant-based ingredients, develops innovative extraction technologies to extract functionally, organoleptically

& nutritionally sound proteins and then makes value-added products. We are starting our journey with a plant-based alternative to eggs and we want people to enjoy the same taste & nutrition of eggs that they love and also to experience healthy & sustainable eating. CFTRI helped us throughout the product development process by providing access to facilities and mentors. Our advice to start-ups will be to focus on the market, understand their exact needs.

New Collaborations

Kadhi and Village Industries Commission (KVIC), Mumbai (July 5, 2022)

MoU was signed to collaborate in the areas of mutual interest through skill up-gradation/ development

training to personnel associated with KVIC units approved under Prime Minister's Employment Generation Programme (PMGEP). It also focuses on entrepreneurship development for skilled people and food processing enterprises across the country.

Events

Dr. Ambedkar Birth Anniversary (July 13, 2022)

As part of 131st Birth Anniversary of Bharath Ratna Dr. B. R. Ambedkar, a seminar on “Dr. Ambedkar and Constitution of India” was held on July 13, 2022 at CSIR-CFTRI. The event was inaugurated by Dr. Ravindranath, IPS, Director General of Police (Training) and Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI presided over the function. The Chief Guest Sri Balan, Advocate and Social Activist delivered the special address.



Azadi Ka Amrit Mahotsav Webinar Series (July-Aug, 2022)

- ✦ A National Hindi webinar was conducted on July 20, 2022. Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI delivered the inaugural address on this occasion. The lectures were given on “Pomegranate seed oil, chestnut and high pressure Technology” by scientific staff of the Institute.
- ✦ Technical invitation talk was held at CSIR-CFTRI on August 12, 2022. The talk on “Indian Sugar Industry: Sugar and beyond” was delivered by Dr. Narendra Mohan, Director, National Sugar Institute, Kanpur.



Independence Day Celebrations (Aug 15, 2022)

Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI, hoisted the National flag as part of the Independence Day celebrations and addressed the staff and students of the Institute.



Stakeholders Workshop (Aug 17-18, 2022)

A two-day Stakeholders Workshop on “Grain Storage and Pest Management” sponsored by UPL Ltd., Mumbai was organized. Dr. Prakash M Halami, Chief Scientist, CSIR-CFTRI briefed about the workshop, the Director, CSIR-CFTRI presided over the function. About 80 participants including farmers, grain storage and other industry personnel, research scholars and professionals attended the workshop.



National Nutrition Week Celebrations (Sep 8, 2022)

National Nutrition week celebrations were held at CSIR-CFTRI. The programme was attended by CSIR-CFTRI School students and teachers. Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI distributed the prizes to winners of various competitions conducted, focusing this year theme “Celebrate the World of Flavors”.



Engineer's Day Celebrations (Sep 15, 2022)

55th Engineer's Day celebrations was held on September 15, 2022 on the occasion of 162st Birthday of Bharat Ratna Sir M. Visvesvaraya wherein Er. H. S. Sathish, Chief Scientist, Director-in-charge, CSIR-CFTRI presided and garlanded the portrait of Sir M. Visvesvaraya and addressed the gathering.



Birth Anniversary Celebrations of Dr. V. Subramanyan (Sep 16, 2022)

Birth Anniversary celebrations of Dr. V. Subramanyan, Founder Director, CSIR-CFTRI was held at CSIR-CFTRI on September 16, 2022. The event was presided over by Dr. Sridevi Annapurna Singh, Director, CSIR-CFTRI. The lectures on Dr. V. Subramanyan's life and achievements was presented by former CSIR-CFTRI scientists Dr. Arun Chandrashekar and Dr. N. Chandrashekar.



Integrated CSIR Skill Initiative Programme (Sep 20, 2022)

- ✦ The workshop on "Entrepreneurship Development in Spice Processing" was held on September 20, 2022 under Integrated CSIR Skill Initiative Programme. Er.H.S. Sathish, Chief Scientist, Director-in-charge inaugurated the

workshop and various talks were delivered by scientific staff. About 78 participants attended the above training programme through hybrid mode.



- ✦ Online workshop on "Post-Harvest Technologies for Horticultural Crops" was conducted on September 30, 2022 under Integrated CSIR Skill Initiative Programme. Sri B.V. Sathyendra Rao, Chief Scientist, CSIR-CFTRI inaugurated the training programme. Talks on various scientific topics were presented by staff of CSIR-CFTRI. About 54 participants attended the above training programme through hybrid mode.

CSIR-CFTRI Open Day-2022 (Sep 26-27, 2022)

The CSIR-CFTRI Open Day-2022, with the theme "Food Technology-Industry Connect" was held during September 26-27, 2022 on the occasion of 81st CSIR Foundation day. Dr. K. S. Sadananda, Professor of Cardiology and Medical Superintendent, Sri Jayadeva Institute of Cardiovascular Sciences & Research in Mysuru, inaugurated the event, as well, as the Food-Expo, and released the compendium of the Licensees participating in the Food-Expo. The event was presided over by Er. H. S. Sathish, Chief Scientist and Chairman of CSIR-CFTRI Open Day-2022. Nearly 18,000 people visited CSIR-CFTRI on these two days and most of whom were students. The machineries, processes and products developed by CSIR-CFTRI were demonstrated to visitors.



Visitors

- ✦ French delegation consisting of French Embassy officials and CNRS Bureau visited the CSIR-CFTRI on September 15, 2022 and interacted with scientific staff pertaining to Indo-French cooperation strategies including funding sources, research opportunities and student mobility



Awards

- ✦ Best Institution (Food Technology) -Poshak Anaaz Award-2022 to CSIR-CFTRI: Mr. Ashok Dalwai, CEO, NRAA, Ministry of Agriculture presented the award during National Nutri Cereal Convention 4.0 held at Hyderabad on September 24, 2022 in recognition of the work done in the area of millets by CSIR-CFTRI. The Director, CSIR-CFTRI received the award along with Dr. M. S. Meera, Head, Grain Science & Technology Department.



Selected Publications

- ✦ Naresh K.S., Kumar Theerthan N., Siva Sankara Reddy Singam., Sachin R. Chaudhari., Selective Homodecoupled 1D-H-1 NMR experiment for unravelling enantiomers, *Anal. Chem.*, 2022, 94(29), pp.10299-10303. (IF: 8.008)
- ✦ Das M., Geetha V., Zarei M., Nanishankar V.H., Kumar G.S., Modulation of obesity associated metabolic dysfunction by novel lipophilic fraction obtained from *Agaricus bisporus*, *Life Sci.*, 2022, 305, art. no. 120779. (IF: 6.78)
- ✦ Mondal P., Natesh J., Penta D., Meeran S.M., Extract of *Murraya koenigii* selectively causes genomic instability by altering redox-status via targeting PI3K/AKT/Nrf2/caspase-3 signaling pathway in human non-small cell lung cancer, *Phytomedicine*, 2022, 104, art. no. 154272. (IF: 6.656)
- ✦ Gyanendra Kumar., Monisha Arya., Padma Radhika., Bijesh Puthusseri., Giridhar Parvatam., Distinct GmASMTs are involved in regulating transcription factors and signalling cross-talk across embryo development, biotic, and abiotic stress in soybean, *Front. Plant Sci.*, 13, art no.948901. (IF: 6.627)

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