

CSIR

Compendium of Technologies in Food Sector

(Technologies at TRL 6 or above)



Source: <https://techindiacsir.anusandhan.net/>

Bioactive Molecular Rich Green Coffee Concentrate

Laboratory: CSIR-Central Food Technological Research Institute

Executive Summary: Green coffee beans are the unroasted coffee beans, a rich source of antioxidants. Green coffee beans are known to have a higher content of Chlorogenic acids (CGA). The extract has the potential to induce weight loss, stimulate liver cells to increase fat metabolism and reduce fat accumulation in the body without causing calorie restriction. The health benefits of green coffee consumption are attributed to the different polyphenols such as chlorogenic acids, caffeic acid, ferulic acid and p-coumaric acids. Over the years, the numbers of cases of lifestyle diseases such as diabetes and obesity have gone up. To combat such ailments, antioxidants and CGA in particular hold an important place, not just as a chemical, but also as a nutraceutical. Green coffee beans remain a promising source of phytochemicals, which can contribute for the improvement in the health and well-being. Enrichment and fortification of other food product using green coffee finds potential avenues in food industry.

Herbal Salt Preparation from Different Plant Source with High Potassium Content

Laboratory: CSIR-Central Salt & Marine Chemicals Research Institute

Executive Summary: CSIR-CSMCRI has developed a process to produce vegetable salt from the halophyte, *Salicornia brachiata*, which contains several important nutrients not normally found in sea salt and, therefore, is promising as a health salt, and the Herbal Salt has been appropriately named as Saloni. Two formulations of salt can be obtained. One formulation is white crystalline and free flowing which contains 85-90 % NaCl, along with 5-10 % KCl, 1-2 % Ca, 1-2 % Mg and 50-100 ppm Fe. The other formulation is more nutritious (referred as Saloni-K) which contains 25-30% KCl from the *Kappaphycus/ Eucheuma* and 65-70% salt from NaCl. The preparation of plant salt involves – cultivation of plant and processing the plant material for production of salt. CSIRCSMCRI has conducted different agri-trials for best biomass production. Studies on cultivation of the plant on saline soils of Sartanpar coastal areas near Bhavnagar showed the possibility of 40-50 tons/hectare fresh weight and 10-12 tons dry biomass/ hectare. Finally, 2 tons salt/hectare can be achieved with best cultivation practice. The local coastal people are unable to grow any economically important crops because of saline soil. To support their weak economic condition, *Salicornia* cultivation can serve as an alternative source, which will improve economic status of the local people and promote soil reclamation of the area.

Tea Catechins

Laboratory: CSIR- Institute of Himalayan Bioresource Technology

Executive Summary: Tea leaves contains 15-20% of total polyphenols of which catechins constitute up to 80%. Epigallocatechin (EGC), epicatechin (EC), epigallocatechin gallate (EGCG) and epicatechin gallate (ECG) are the major catechins. These catechins are high value antioxidants with nutraceutical properties. This technology is beneficial for upliftment of tea industry through value addition of tea leaves.

Ready to Serve Tea Concentrates

Laboratory: CSIR- Institute of Himalayan Bioresource Technology

Executive Summary: Tea is the second most consumed beverage after water that has gained wide interest due to numerous health benefits. A process has been developed to prepare concentrates from green and black tea with refreshing taste and natural health attributes of tea. These concentrates can be reconstituted with hot as well as cold water. This technology is beneficial for upliftment of tea industry through value addition of low-grade teas.

Ready to Eat Crispy Fruits and Vegetables

Laboratory: CSIR- Institute of Himalayan Bioresource Technology

Executive Summary: India loses about 25% of the fruits and vegetable produce due to inadequate storage and processing facilities leading to poor economic returns to farmers. CSIR-IHBT developed crispy fruit and vegetable technology to reduce the post-harvest losses and also for application of the processed fruits and vegetables as ingredient in packaged foods. India is second largest exporter of processed and preserved fruits and vegetables. Indian dehydrated fruit and vegetables market is estimated to be reach USD 3 billion by 2022 with a compound annual growth rate of 12%.

Canning Technology for Ready to Eat (RTE) Foods

Laboratory: CSIR- Institute of Himalayan Bioresource Technology

Executive Summary: CSIR-IHBT has developed an indigenous technology for commercial production of ready-to-eat foods (RTE) free from additives and chemical preservatives. These RTE food products are in line with the changing consumer preference for healthy, convenient and on the go foods. The technology was used for successful revival of traditional ethnic foods such as Kangri dham. Indian RTE market is estimated to reach Rs. 2900 crores by 2022 with a compound annual growth rate (CAGR) of 25%.

Cultivation of Shiitake Mushroom and its Enrichment with Vitamin D2

Laboratory: CSIR- Institute of Himalayan Bioresource Technology

Executive Summary: The fresh Shiitake mushroom has rich, buttery flavour that makes it different from other mushroom variety. Dried shiitake has meaty texture and smoky flavour, and hence are most prevalent in Asian dishes. Apart from its taste and flavour it is rich in vitamin D precursor ergosterol. Vitamin D deficiency is prevalent in >70% of Indian population. Beyond bone health, the deficiency is associated with cancer, autoimmune diseases, infections, type 2 diabetes, hypertension, cardiovascular disease, etc. For vegetarians, mushrooms are the only food source of Vitamin D. CSIR-IHBT has developed a technology for enhanced production of ergocalciferols (Vitamin D2) from Shiitake mushroom. The uniqueness of the technology is that it has reduced the cultivation time of the mushroom to 2 months as opposed to 8-12 months. And, the enrichment of Vitamin D2 is such that a capsule of 500 mg shiitake powder can meet more than 50% RDA of Vitamin D2. This technology can be a good source of livelihood creation under Micro, Small and Medium Enterprises and Cottage Industry.

Multigrain High Protein Mix

Laboratory: CSIR-Institute of Himalayan Bioresource Technology

Executive Summary: The prevalence of malnutrition in India is one of the highest in the world affecting majorly the rural population. According to National Family Health Survey 4 (2015-16), malnutrition assessed by the proportion of underweight children below the age of five was 43% and 36% in women of reproductive age in India, higher than in sub-Saharan Africa (28%) and South Asia (42%). Malnutrition contributes to approximately 2.1 million children deaths before the age of ten every year. Inability to achieve minimum dietary intake levels of energy, protein along with deficiency of essential nutrients such as vitamin A, iron, zinc is linked to a higher risk of death. Government has set a target for reduction of underweight by 2% and anaemia by 3% per annum as part of National Nutrition mission. CSIR-IHBT aimed at contributing low cost nutritious food product addressing protein and energy malnutrition in children and women of reproductive age. The product is made with simple and nutrient dense ingredients such as pulses, millets, cereals and pseudo-cereals of Himalayan terrain and other parts of India. The product is a multipurpose food ingredient with applications such as beverage and smoothie mix that can be consumed with milk/water/fruit juices and as a protein fortifying food ingredient in breads and ready to eat foods.

Vitamins C Enriched Chewable Tablets from Hippophae rhamnoides (Sea Buckthorn)"

Laboratory: CSIR- Indian Institute of Integrative Medicine

Executive summary: Vitamins are substances that our body needs to grow and develop normally. Vitamin-C comes from fruits and vegetables and acts as an antioxidant. It is important for skin, bones, and connective tissue. It promotes healing and helps the body absorb iron. Hippophae rhamnoides (Sea Buckthorn) is abundantly available in Leh and Ladakh region and is enriched with the vitamins including vitamin-C. Although, there are many products available in the form of vitamin-C supplement in market, most of them are derived from synthetic/chemical process. The current product developed is in chewable tablet form and address the issue of vitamin-C deficiency along with other vitamins. The total dosage of product is 750 mg. having 225 mg. of Sea Buckthorn pulp with disintegration time of around 11 minutes. Proposed product is not available in the Indian market

Double Fortified Salt Technology for Fortification of Salt with Iron and Iodine

Laboratory: CSIR-Central Salt & Marine Chemicals Research Institute

Executive Summary: Iron and iodine are essential elements for the human body. Iodine deficiency disorder (IDD) and iron deficiency anaemia (IDA) are caused by insufficient intake of iodine and iron, respectively that have serious detrimental effects on human physiology and adversely contribute to economic and social development of the Nation. Globally 1.88 billion people are at risk of Iodine deficiency disorders (IDD) due to insufficient iodine intake and 2 billion people suffer from iron deficiency with India having a larger share for the latter. CSIR-CSMCRI has developed an IP-secured innovative process for fortification of salt with iodine and iron using inorganic matrix compound. This inventive process helps in retaining the white colour of the salt and preserving the effective concentration of iodine and iron intact over a long period of time. It showed 85% positive impact in Hb value and with improved iodine indicators over a 10 month trial tested for over 300 volunteers, and is significantly better than those available currently in the market. Process has been scaled up and the production cost of DFS is ₹2/Kg. Customer feedback studies

A Process for Gluten Free Bakery Products

Laboratory: CSIR- Central Food Technological Research Institute

Executive Summary: The gluten free cookies have golden brown crust colour, medium sized islands, creamish white crumb colour, crisp texture and typical taste of cookies. The shelf life of the product (cookies) is about three months. The Gluten Free Muffin has good volume, medium fine crumb grain and soft texture. The shelf life of the product (muffins) is about 5 days. Further, cookies and muffins developed are gluten free and hence these can be considered as immunologically safe for celiac disease patients as well.

Foods for Diabetics

Laboratory: CSIR- Central Food Technological Research Institute

Executive Summary: The products prepared from wheat and legumes, blended with special edible ingredients having hypoglycemic characteristics will be useful as ready-to-cook (RTC) or ready-to-eat (RTE) foods or as dietary supplement for the population of physio-pathological conditions with non-insulin dependent Diabetes mellitus (NIDDM) or Type 2 diabetes. Both RTC and RTE foods may be used as wholesome food, food supplement or as meal replaces by these subjects. The RTC food could be cooked in the form of traditional or other recipes of choice for consumption as breakfast, lunch and dinner, whereas, RTE food could be used as snacks in convenient form or as part of meal with other commonly available non-sugar adjuncts.

Nutra Chikki with Added Spirulina

Laboratory: CSIR- Central Food Technological Research Institute

Executive Summary: Chikki is a ready to eat traditional sweet snack consumed by all sections of population in India. The product can be utilized under the label ready to eat sweet snack or enriched snacks and supplied to school children or pre-schoolers or any other specific target group as a ready to eat food and a concentrated source of energy and protein. Spirulina, a blue green alga (cyanobacterium) has been extensively studied and is now in widespread usage throughout the world as a health food and a dietary supplement. Spirulina is a concentrated source of protein, vitamins, especially B12, Provitamin A (β carotene) and Vitamin E, minerals, especially iron. It is also rich in gamma linolenic acid (GLA) an omega 3 fatty acid.

A Process for Low Glycemic Index Noodles

Laboratory: CSIR- Central Food Technological Research Institute

Executive Summary: Noodles and Pasta are major group of food products consumed all over the world. Noodles are considered to be high glycemic foods because of its high release of sugars during digestion and absorption. Incorporation of low glycemic index ingredients to these noodles will lower the glycemic response. The reason for the same is due to increase in the dietary fiber and also protein content. Rajma is well known low GI ingredients and not used in noodle processing so far. Dietary fibers (both insoluble and soluble) from rajma shown to reduce the rise in blood glucose and increase insulin sensitivity following carbohydrate meals. The developed Low GI noodles formulation could be used for normal and diabetic population. The Low GI noodles have increased fiber content by 3- 4% compared to normal noodles. It can be consumed along with tastemaker as a main course.

Title: Exopolysaccharides for Food Grade Application

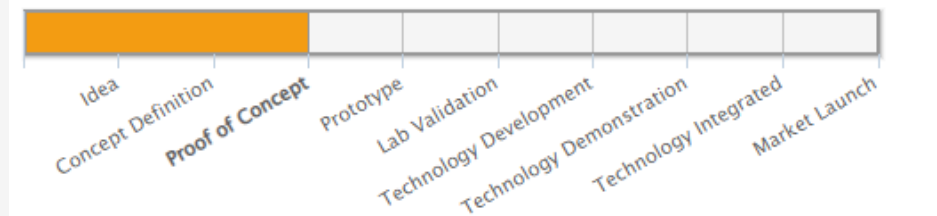
Value Proposition: Exopolysaccharides are produced by probiotic bacteria. Exopolysaccharides help in improving the quality of dairy products.

Summary Application: These exo-polysaccharides also have prebiotic effect and help in growth of other probiotic strains. There are reports of exo-polysaccharides obtained from probiotic microbes having immunomodulatory functions. The use of exo-polysaccharides in dairy industry will improve product quality, stability and positive effect on gut health.

Advantages: It is used for functional food preparation , Probiotic fortification to improve texture , rheology ,prevention of syneresis and functional properties etc

Commercialization Status: Licensed awaiting commercialisation

Tech. Readiness Level:



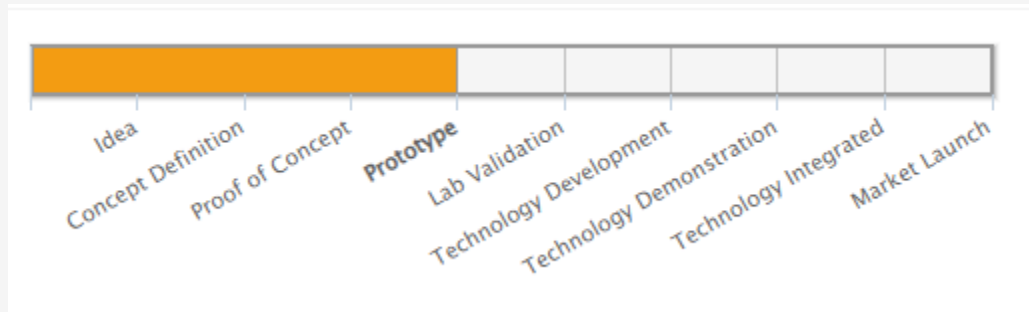
Title: Digital Grain Moisture Analyser

Value Proposition: It is based on capacitance variation technique. The instrument comprises of mainly an analog section and a digital section. For controlling the complete functioning of DGMA, it uses power efficient, high speed microcontroller (MCU) chip. The sensing system is made up of capacitive transducer that converts moisture contents into an electrical signal. Presence of a very small quantity of water causes considerable change in the dielectric constant of the sensor cell. These moisture variations change capacitance and in turn are measured in terms of frequency variations. These variations are then further trend fitted and calibrated in terms of percentage moisture. The final result in terms of moisture percentage, temperature of sample, date and time of measurement is displayed on LCD for a given sample under measurement.

Summary Application: For grain harvesting, procurement, storages and food processing industries, etc to ensure right quality and perseverance of quality.

Advantages: Very small quantity of moisture can also be measured

Tech. Readiness Level:



Title: Mercury-Free Plasma UV-Lamp or MFP-UV-Lamp

Value Proposition: mercury-free plasma UV lamp technology for use in household water purifier systems, storage/sewage/waste water treatment plants, municipality water treatment plants.

Summary Application: The UV light sources used in household water purifier systems, storage/sewage/waste water treatment plants, municipality water treatment plants. Further, application specific systems can be developed for sterilization of food, medical equipment, surfaces, ill skin conditions, air-conditioners and air fresheners for hospitals, titanium coated toilet sterilization in trains, water supply in trains and buses, portable water purifiers for soldiers, outdoorsmen, farmers, etc.

Advantages:

- Filamentless light source
- No end sleeves
- Negligible start-up time,
- Scalable in dimensions
- Easily repairable
- Broad wavelength coverage due to dimer (or molecular) radiations,
- Medium pressure lamp and mercury free.

Commercializatio Already Commercialised

n Status:

Tech. Readiness
Level:

