FOOD AND NUTRACEUTICAL PROFILE

CSIR-INSTITUTE OF HIMALAYAN BIORESOURCE TECHNOLOGY

PALAMPUR (H.P.) INDIA

VISION

To be a global leader on technologies for boosting bioeconomy through sustainable utilization of Himalayan bioresources

MISSION

To discover, develop and commercialize processes and products from Himalayan bioresources using cutting-edge science and technology

CSIR-IHBT has established the high end food and nutraceutical facility to lead functional foods and nutraceuticals research for health and nutrition management. The main focus is to develop high value food & nutraceutical products using innovative methods and preclinical evaluation with internationally acceptable standards. Also utilizing traditional and underutilized bioresources for high-end health and wellness products. CSIR-IHBT is committed towards development and transfer of knowledge and offers services by way of contract R &D projects, consultancy, usage of R&D facilities, and training programmes for SHG's, start-ups and farmers in food sector.

Shiitake mashroom: vitamin D enriched

Shiitake (*Lentinula edodes*) is an edible mushroom which has high medicinal value. Vitamin D is essential for bone health and to boost immune system. A technology for enhanced production of ergocalciferols (Vitamin D_2) in Shiitake mushroom has been developed. Shiitake mushroom has high global demand and is expected to reach approximately 4500 tonnes by year 2025, with an estimated market value of USD 35.4 billion. International demand for vitamin D_2 is estimated to reach USD 140 million by 2025 growing annually at 1.2%.

Salient features of the technology: Captive cultivation for Vitamin D_2 enriched mushroom in 2 months, yield of 0.5-0.6 kg fresh fruiting body per kg of dried substrate and encapsulated 500 mg shiitake powder meets 50% recommended dietary allowances (RDA) of Vitamin D_2.

Shiitake mushroom and powder

Gluten free food from buckwheat

Buckwheat, a pseudo-cereal, is a gluten free crop that belongs to the genus Fagopyrum. In Himalayas, it grows in high altitude, cold desert regions. A variety of ready to eat (RTE) products containing buckwheat provides choice of gluten free food. Gluten free food product market is fast growing and is expected to reach USD 6.4 billion by next decade. It is estimated that currently about 80 million people are gluten intolerant and suffer from celiac disease in India. Buckwheat is a boon for gluten intolerant population suffering from celiac disease.

Salient features of the technology: Large scale handling of micro-shoots, buckwheat flour and puffs as gluten free ingradients in RTE foods, standardized processes for production of instant products (noodles, pasta and extruded snacks), products are free from additives and chemical preservatives, buckwheat products contain beneficial polyphenol- rutin up to 0.4% of dry weight and average shelf life of buckwheat products is up to 4 months.

Buchwheat-based bars

Buchwheat

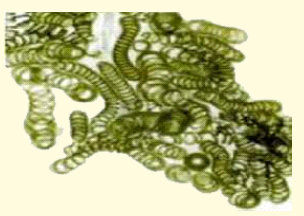
Buchwheat-based noodles

Iron and zinc enriched spirunila-based bars

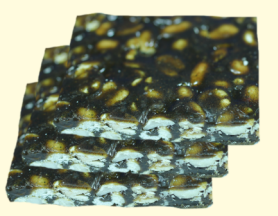
Spirulina, a blue green alga (cyanobacterium) has been consumed worldwide as a health food and a dietary supplement. Spirulina contains essential fatty acids gamma linolenic acid (an omega 6 fatty acid), antioxidant phycocyaninis and is a concentrated source of protein, vitamins, provitamin A (β-carotene), and minerals (iron and zinc).

CSIR-IHBT has developed ready to eat foods incorporating Spirulina for fortification of iron and zinc utilizing different food matrices such as peanut, sesame and cereals that meets at least 20% of recommended dietary allowances (RDA) of iron and zinc. Spirulina and algae based functional foods market is pegged at USD 2 billion and is growing annually at 5.6%. Algae based functional food is expected to reach USD 4 billion by year 2025. India is second largest exporter of food grade Spirulina biomass.

Salient features of the technology: Meets 25% RDA levels of iron and zinc per 30g serving, preservative and additive free, meets 8% RDA level of beta carotene (pro-vitamin A) per serving, Meets 6-8% RDAof proteins per serving, source of nutraceuticals- Phycocyanin (4 mg per serving) and shelf life of the product is up to 3 months.



Spirulina platensis



Spirulina-based peanut bar

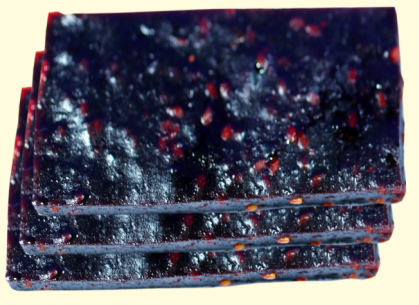
Spirulina-based chocolate bar

Iron enriched fruit bars and candies

Deficiency of micronutrient iron is a major health concern in India. According to National Family Health Survey 4 (2015-16), 58% children below age 6 and 53% of women of reproductive age between 18 and 49 years are anaemic due to iron deficiency. CSIR-IHBT has developed cost-effective technology for production of ready to eat (RTE) foods to address iron deficiency by providing a minimum of 20% recommended dietary allowances (RDA) of micronutrients.

Salient features of the technology: Products provides 25-30 % RDA of bioavailable iron per 30g serving, utilizes natural bio-resources such as crop residues and spice mixes, free from additives and preservatives and shelf life of the products is upto 6 months.

Target population: Pre-schoolers, school going children, adolescent girls, pregnant and lactating mothers.



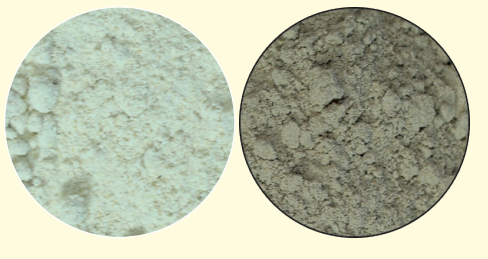
Iron enriched fruit bar

Multigrain high protein mix

A low cost technology for commercial production of protein rich beverage mix, addressing protein and energy malnutrition. The product is a multipurpose food for use in 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. The global market for protein fortified foods and beverages is estimated to reach USD 59.3 billion with a compound annual growth rate of 5.9% by year 2022 of which one fifth to be contributed by Indian market at USD 12 billion.

Salient Features of the technology: Developed using 100% natural and nutrient dense ingredients (whole grains: millets, cereals, pseudo-cereals and pulses), provides 200-250 Kcal energy and 10g protein per 50g serving, meets 22% recommended dietary allowances (RDA) of proteins, 10% RDA of dietary fibre, 15% RDA of iron and calcium, free from preservatives, maltodextrin and thickeners, non-hygroscopic and free flowing and shelf life of the product is up to 10 months.

Multigrain high protein beverage



Multigrain high protein mix

Protein and fibre enriched cereal bars

Protein malnutrition is a major health concern affecting Indian population mainly children below 6 years and women of reproductive age (15 to 49 years). According to National Family Health Survey 4 (2015-16), 38% of children below 6 years are under weight stunted, and almost 60% of women do not obtain the daily protein requirements. CSIR-IHBT developed a low cost technology for commercial production of protein and fibre enriched cereal bars that meets at least 20% recommended dietary allowances (RDA) of protein and fibre. The global protein and energy bars market is currently USD 2.3 billion growing annually at 8.4 % and expected to reach USD 3.5 billion by year 2025.

Salient features of the technology: Ready to eat food with 150 -200 Kcal energy and 6-8 g protein per 40g serving, developed using 100% natural ingredients like wholegrains, millets, pulses, dehydrated fruits and nuts, preservative and additive free, 4 g fibre per serving, low saturated to unsaturated fat ratio (1 :4), low sugar content (<7g) and shelf life up to 4 months.

Granola Bar

Tea catechins

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, which are high value antioxidants with nutraceutical properties. The global market of polyphenols is estimated to reach USD 210 million by year 2022 at a CAGR of 15%.

Salient features of the technology: Green technology for catechins production from green tea leaves, product is free from toxic chemicals and solvents and shelf life of catechins is 12 months.

Patent granted: 926681882/US/2016; 104105685A/CN/2016; 2015508070A/JP/2017

Catechins powder

Catechins capsules

Tea wine

Wine is an un-distilled fermented beverage mainly produced from grapes and fruits. A tea based wine has been prepared to harness the health benefits of tea. Tea wine is a good source of antioxidants. It is a unique product that can be prepared from premium as well as low grade teas. Wine can be made sweet and dry on demand with varying alcohol content ranging from 9% to 15 %. Estimated global market of wine is USD 302 billion with an annual growth of over 5 %.

Salient features of the technology: Low alcoholic beverage with high quality, either sweet or dry, 1 ml of tea wine contains400-600 µg of trolox equivalent antioxidants, Can be prepared using under-utilized fruits along with low grade teas and a self-preservative herbal product with valuation increases on maturation.

Patent granted: 679395762/US/2004

Tea wine

Ready to serve tea concentrate

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. Estimated global market of tea concentrates and ready to drink teas is USD 76 billion in 2017 with annual growth of 7 %.

Salient features of the technology: 1 ml of tea concentrate contains 3-4 mg of trolox equivalent antioxidants, Shelf-life is upto six months, No added chemical preservatives or colors in the concentrates, green as well as black tea can be used and can be served with/without sweetener.

Tea concentrate and Ready to drink tea

Ready to eat crispy fruits and vegetables

The technology for production of crispy fruits/ vegetables can help reduce the post-harvest losses, which are estimated to be about 25% of its production due to inadequate storage and processing facilities. Crispy fruits are high grade consumers products, made available in packaged form. India is the second largest exporter of processed and preserved fruits and vegetables. Indian dehydrated fruit and vegetables market is estimated to reach USD 3 billion by year 2022 with a compound annual growth rate of 12%.

Salient features of the technology: Retains near to original nutrition, texture, taste, aroma and color, No added preservatives or additives in the product, Refrigeration is not required for storage, Shelf life is greater than 6 months at room temperature, Excellent reconstitution capacity - regains near to original taste, texture and aroma.

Patent filed: 0032NF2018/IN

Sapota

Corn

Beetroot

Canning technology for ready to eat (RTE) foods

CSIR-IHBT has developed an indigenous technology for commercial production of RTE foods. These food products are free from chemicals and preservatives and 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 year 2022 at a CAGR of25%.

Salient features of the technology: Chemicals and preservatives free, Shelf life up to 12 months, retains the original aroma and taste, retains the health benefits of the products such as pre biotic effects, process standardized for products such as Kangri Dham (an etty,ic food of Kangra region of Himachal Pradesh), Khichadi (a mix of rice and pulses) and Halwa (a sweet dish made of semolina, flour and other similar ingredients)

Kangri Dham

Stevia: agro-and processing technology

Excessive intake of cane sugar leads to complications like diabetes and obesity. Stevia (*Stevia rebaudiana* (Bertoni) Bertoni) is a safe alternative source of low caloric natural sweetener. Stevia leaves contain sweet-tasting and low-calorie diterpenoid steviol glycosides (Sgs). Amongst the known SGs, the most important glycoside is rebaudioside-A, which is about 300 times sweeter than sucrose. CSIR-IHBT has standardised agro and processing technology of stevia.

Market potential: Global market for stevia is currently estimated at USO 490 million at a CAGR of 9.5% and expected to reach USO 800 million by year 2025.

Salient features of the technology: Improved variety having high rebaudioside-A(-7.4%), good agricultural practices for different agro-climatic conditions, green process technology for the production of white steviol glycosides powder, ready to serve stevia liquid and powder sachet, high quality steviol glycosides powder with purity of>95%

Steviol glycosides: powder, sachet and liquid drops

Technology for dietary fiber extraction from apple pomace

Apple pomace, a residue obtained after apple juice extraction, is generated in huge quantity (about 3000-5000 MT per annum) from apple beverage industries. An indigenous technology for extraction of dietary fibre from apple pomace has been developed to convert this highly perishable residue causing environmental pollution to high economic value ingredient. This dietary fibre finds several applications in food and additives industries. A patented prototype has been developed to separate the seed without any damage from pomace at industrial scale. Quality edible oil can be extracted (with a recovery of 15% -20%) from separated seeds which is rich inpolyunsaturated fatty acids.

Market potential: The dietary fibre market is expected to reach USO 5.9 billion by 2022 at a CAGR of 13. 7%

Salient features of the technology: Fibre content recovery up to 60%, extracted fibre is light in colour and bland in taste, fibre obtained has free flowing texture

Patent granted: 9011952/US/2015; 2591465/RU/2016

Industrial Apple pomace

Apple dietary fiber

Contact: Director, CSIR-IHBT, Post Box No. 6, Palampur (Himachal Pradesh) 176061, INDIA
www.ihbt.res.in, E-mail: director@ihbt.res.in; Ph: 01894-230411, Fax: 01894-230433

August 2019