Newsletter

December 2021 Inaugural issue

FUNCTIONAL FOOD ASSOCIATION OF INDIA (FFAI)

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A **Functional Food** is similar in appearance to conventional foods, is consumed as a part of a normal diet and has demonstrated physiological benefits and/or reduces the risk of chronic disease beyond basic nutritional function. Traditionally, India is well known for eating healthy food. The surge in industrialization, per capita income, corporate culture, little knowledge of consumers about the right choices of healthy food and easy access to fast-junk food has led to the adoption of Western food habits by the youth of the country thereby, making them susceptible towards chronic diseases at an early age. The risk of CVD, cancer, diabetes, kidney failure, liver ailments and poor gut health is increasing year-after-year. In the year 2020, the prevalence of high diabetes risk in young adults (<35 years) has been reported to be about 10 per cent. The easy way-out to address the food related disease issues is by deliberating them in some scientific forum and subsequently educating the people about the healthy food choices. The department of Food Science and Technology at Dr YS Parmar University of Horticulture and Forestry, Solan, Himachal Pradesh, India has therefore, taken an initiative to create an association to be known as "**Functional Food Association of India**" **(FFAI)** to address the food related issues.

In this issue

Editor-in-Chief & his team

Mission and Goal: FFAI will be instrumental to expand the horizons of R&D, education and dissemination of the knowledge of functional foods in India and abroad especially with respect to the i) promotion of co-operation between R&D institution(s) and food industry ii) recognition of excellence of the scientific person(s) working in the field of functional foods iii) publication of the findings of R&D work through journal and/ or newsletter as decided by the association iv) dissemination of knowledge on various aspects of functional foods by organizing seminars, symposia, conferences, workshops and last but not the least v) guidance of government(s) on policy issues related to healthy foods introduction and promotion in the public distribution system and nutritional programs of the states/ country.

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Message from the Patron of FFAI

It gives me immense pleasure to learn that the scientists of the department of Food Science and Technology, Dr YS Parmar University of Horticulture and Forestry have taken an initiative to form *Functional Food Association of India* (FFAI) with its head quarter at Solan. We understand that the health and wellness of people is largely dependent upon the consumption of nutritious foods. The role of food(s) in maintaining health and prevention and curing of diseases has been very well described in the Hippocratic and Vedic texts. In India, the shift from a traditional to modern lifestyle, consumption of diet rich in fat and calories combined with a high level of mental stress has resulted in increased incidences of lifestyle related diseases e.g. coronary heart disease, obesity, diabetes, cancer and hypertension. In the last two decades, the scientific evidences linking role of food in maintaining good health and preventing diseases, aging, adverse effects of allopathic medicines and the rising health care costs are some of the factors for shift of a large population, particularly in the developed world, towards functional foods and nutraceuticals. The functional foods are the foods that resemble traditional foods but possess demonstrated physiological benefits. The main focus of such foods is to improve health and reduce disease risk through prevention. Fresh fruits and vegetables are well-known functional foods but, the foods that have been fortified, enriched with nutrients, phytochemicals as well as dietary supplements are also covered under this category.

I am sure, the Functional Food Association of India shall provide an excellent platform for discussion, knowledge sharing and dissemination in the field of functional foods amongst the researchers, academician, entrepreneurs, farmers and industry. I applaud the efforts of the Editors-in Chief and his team to publish the Newsletter and it is expected that the stakeholders in R&D institutions, academia, entrepreneurs and food industry of the country shall make use of the forum to share their valuable ideas for holistic development of Functional Food Science and Technology. I congratulate the founder members and convey my best wishes for the success of this association.

Dr Parvinder Kaushal, Vice Chancellor
Dr YSP UHF, Solan

Message from the President of FFAI

I am privileged by the opportunity to serve as the founder President of the FFAI, anticipated to grow as one of the largest food associations of the world. In 1980, Japan was the 1st country to realize the ill effects of junk food, thereby introducing the idea of functional food, based on the 2500 years old concept of "*Let food be the medicine and medicine be the food*" leading to delayed onset of food related chronic diseases with ultimate increase in life-span. To address the chronic health concerns of millions in India, a huge investment is required for the creation of medical infrastructure by the central and/or state goverment(s) which seems to be a challenging task. The easy way-out to address these issues is by educating the people about the healthy food choices. The department of Food Science and Technology, Solan is one of the oldest departments in the country and with the R&D efforts of the scientists, a large number of plant-based health foods have been developed. Recently, many universities/Institutes in the country have established the department of Food Science, Food Technology, Nutrition, Food Science and Nutrition, Postharvest Technology, Food Biotechnology etc where most of the scientists have given special emphasis on the development of healthy foods and their safety concerns. Consequently, the need to have some scientific forum to deliberate on the issues pertaining to systematic R&D and delivery of the functional food technologies amongst the stakeholders/ consumers was being felt for quite some time.

After thorough discussion with the colleagues working in the disciplines of Food, Nutrition, Biotechnology and Postharvest Technology across the country, an initiative has been taken by the scientists of the department of FST at Dr YSP UHF, Solan for creation of an association known as "**Functional Food Association of India**" (FFAI). It is expected that the FFAI would be instrumental to expand the horizons of R&D, education and dissemination of the knowledge of functional foods in India and abroad. I wish and encourage all the members to be actively involved in the activities of the association including research scholars. It is proposed that the 1st conference on functional foods shall be held at Solan next year. With best wishes,

Krishan D Sharma, Prof & Head (FST)
Dr YSP UHF, Solan

Concept Messages on Functional Foods

Digitalization for authentication of functional foods

A healthy diet is an important part of a healthy lifestyle. Digitalization of health and functional foods is one of the hot topics in top-notch tech companies e.g. Apple and Google. Similarly, health-related companies and healthcare institutions are adopting digital technology as part of their services, allowing new healthcare concepts such as telemedicine including, at-home monitoring of patients, virtual appointments, patient portals etc. This makes healthcare to be more accessible for consumers at home so that they can manage their health more efficiently. Accordingly, such approach is being induced to nutrition and functional food sectors, providing personalized solutions. Functional foods, in general are beneficial for all but personalization increases effectiveness, improves consumer compliance and approval therefore, permitting the development of new business models for functional foods and nutraceuticals. Modern health conscious individuals take great care of what they eat and adjust their diet specifically to their lifestyle. They continuously monitor their fitness and other health data by using wearable tracking devices such as fitness wristbands to record and maintain their daily data. Simultaneously, these data are used to optimize people's diet. The increasing digitization of value chains enables manufacturers to produce and sell customized products which meet the individual requirements of their customers. This also permits the addition of suitable health-promoting substances in order to customize functional foods to individual customers' needs. Further, customized functional food could be offered to customers on the basis of this data. This means that the customer places an order to continuously buy customized product e.g. yoghurt. As soon as the next delivery is due the actual fitness/ health status is automatically retrieved from the wearable manufacturers' databases and the individual yoghurt is produced. Another grey area pertaining to the application of digitalization solutions is the authentication of functional ingredients and product claims. Currently, there is no practical mechanism which ensures that a product contains claimed percentage of fruit part or the functional ingredients. Also, the authenticity of the claimed sources of ingredients or products i.e. whether vegan or not, whether added sugar or not, whether originally from a geographical indicator area or not are also not practically traceable. Digitalization is the only way to verify the claims like *"contains 40% juice"*, *"contains no added sugar"*, *"California almonds"*, *"Himalayan honey"*, *"Indian Basmati"* etc. This shall not only increase trust and confidence amongst customers but also be a handy tool for the regulatory agencies for effective implementations of standards and regulations. The rights of consumers to know all details about what he/ she is consuming as well as get customized solutions for their health and eating preferences, the digitalization is the only answer and therefore, the consumers and the food industry should not hesitate to go digital.

Satish K Sharma & Deepa Saini,
FST, GBPUA&T, Pantnagar

Mushroom: A potential functional food

Food is the basic and vital necessity of quality life and poor peoples on one-hand are struggling with mal-nutrition while the affluent society is having health issues with wrong choices of food. Mushroom is a complete nutritious vegetarian delicacy having high quality protein. In India, five mushrooms *viz.*, white button, oyster, paddy straw, milky and shiitake are cultivated commercially, having carbohydrates (50–65%), proteins (19–35%) and essential fatty acids (2–6%) with traces of vitamins and minerals. These mushrooms are a good source of many functional ingredients e.g. β-glucans, lectins, unsaturated fatty acids, phenolic compounds, tocopherols, ascorbic acid, alkaloids and carotenoids. Further, they also contain minerals for human health including K, P, Na, Ca, Mg, Cu, Zn, Fe, Mo and Cd. People suffering from diseases/ disorders like hypertension, diabetes as well as obesity can use mushrooms in their daily diet. The properties like anti-mutagenic, anti-aging, anti-viral, anti-bacterial, anti-fungal and anti-carcinogenic particularly in Reishi, willow bracket fungus and oyster have also been reported. It has been found that even after cooking of mushrooms, there is no significant reduction in the vitamins and other vital nutritional components making them super foods with various functional components. It has been well established that the inclusion of mushrooms in food products enhances their nutritional and health potential and therefore, the nutraceutical industry could use mushrooms as well as their bioactive compounds for the development of potential functional food products to fight mal-nutrition and take care of chronic life-threatening diseases.

Brij Lal Attri,
ICAR-DMR, Solan

Nutrigenomics: An approach to personalized healthy food

Food has played a significant role in maintaining health and improving the quality of human life for thousands of years. In traditional foods and herbs, a wide variety of active phytochemicals including, the flavonoids, terpenoids, lignans, sulfides, polyphenolics, carotenoids, coumarins, saponins, plant sterols, curcumins, and phthalides, have been researched and found to possess important activities in health promotion and diseases elimination e.g. the turmeric has been found to increase detoxifying enzymes, prevent DNA damage, improve DNA repair and decrease mutation and tumor formation. The study of nutrients on health through altering genome, proteome, metabolome and the resulting changes in physiology leads to the science of nutrigenomics. In the past, the nutrition research is mostly concentrated on nutrient deficiencies and impairment of health. However, with the advent of genomics, an understanding of scientific information about the composition and functions of genomes, has created unprecedented opportunities for increasing our understanding that how bioactive compounds modulate gene and protein expression and ultimately influence cellular metabolism.

Nutrigenomics is a multidisciplinary science that applies the genomic techniques besides, the biochemical and epidemiological aspects, with the aim to understand the etiology of chronic diseases e.g. cancer, CVD, type-2 diabetes, obesity, metabolic syndrome etc. The genes are important in determining a physiological function but, nutrition is able to modify the degree of gene expression. There is now good evidence that functional food ingredients have significant influences on the expression of genes. A significant number of human studies in various areas are increasing the evidence for interactions between single nucleotide polymorphisms (SNPs) in various genes and the metabolic response to the important constituents of food we eat. Many of the same genetic polymorphisms and dietary patterns that influence obesity or CVD also affect cancer since, overweight individuals are at increased risk of cancer development. The entire dietary intake affects the gene expression directly or indirectly. Human diets of plant origin contain many hundreds of bioactive compounds which are not considered as nutrients but, play a great role as functional food for health wellbeing.

Krishan D Sharma,
FST, Dr YSP UHF, Solan

Non-thermal processing to preserve functionality of juice

Developments in functional food products will continue to emerge in the future as the consumer demand for healthful products is growing day-by-day. This increase in demand is mainly contributed by the growing ageing population, increase in health care costs and desire to enhance personal health. Conventional food processing involves heating wherein heat energy is transferred into the product directly. Heating leads to loss of flavour, colour, aroma and functional compounds like polyphenolics, flavonoids and vitamins. Non-thermal processing includes the use of ultrasonication, ozonation, pulsed electric field, ionizing radiation, cold plasma and high-pressure processing.

India stands as a global leader in fruit and vegetable production. During 2019-20 about 99.07 million metric tonnes of fruits and 191.77 million metric tonnes of vegetables were produced in India. Fruit and vegetables are rich sources of bioactive compounds like phenolics, flavonoids, vitamins and minerals and provide additional benefits against degenerative diseases like cancer, cardiovascular and other diseases. Natural fruit juices accounts for 30% of market shares, while squash market share is expected to reach 3.6% of market share by 2025. Similarly, RTS and nectar market share are expected to increase from 1.2 to 2% in the same period.

However, the quality and their functional ingredients retention is an important concern as thermal processing of juices by conventional heating deteriorates them. Pineapple juice quality monitored after thermal processing at a temperature ranging from 55-95°C showed destruction of carotenoid pigments and increased the hydroxymethyl furfural value, which increased linearly with heating time and temperature. Increased browning has also been reported after high temperature treatment of several juices. These shortcomings of thermal treatment and the increasing demand for minimally processed foods lead to research on novel and effective non-thermal techniques.

It is expected that functional foods and their ingredients have a decisive role in human health and nutrition for the wellbeing of world population.

Pradeep S Negi,
CFTRI, Mysore

Non-alcoholic malted beverages

Beverages are an optimum medium not only to transport various nutrients and bioactive compounds into the body but they also facilitate their bioavailability. Fermentation has been widely used to improve the nutritional value, digestibility level, shelf-life, functional properties and sensory attributes of the beverages. Worldwide, beer and wine are among the oldest and the most consumed alcoholic beverages. However, the consumers' concern for healthier and nutritionally enriched drinks as a substitute to these alcoholic beverages has encouraged the researchers and food industry for their alternatives. The market for non-alcoholic malted beverages is steadily growing with the increased interest of consumers in health and alcohol abuse issues. Malt beverage is a category of beer that has motivated the breweries to expand and merchandise low-alcoholic products as the innovative products to the people. Malted beverages have the nutritional content of the cereals from which they are made and are wholesome drinks with negligible level of alcohol. They contain high levels of fiber and bioactive compounds like phenolics, vitamin E, B_2, B_6 and B_{12}, folic acid, niacin and minerals and possess antibacterial, antidiabetic, antithrombotic, anticarcinogenic properties besides, regulating blood circulation and improving the central nervous system. Therefore, they are being considered as potential future functional drinks which could be consumed by the people across the religious boundaries and age barriers. Accordingly, this will promote a global community of smart drinking leading to better health and thereby, minimizing health hazards of alcohol consumption.

Rakesh Sharma & Satish Kumar,
FST, Dr YSP UHF, Solan

Fermented functional foods

Fermented foods have a long history and they constitute a significant part of the diet across the globe. Fermentation contributes functional attributes to the foods and reduces anti-nutritional factors present in the raw foods besides, provide an additional nutrition. The consumption of functional fermented foods and beverages help to fight or delay chronic diseases. Functional compounds such as short-chain fatty acids, organic acids, bioactive peptides, carotenoids, flavonoids, vitamins, γ-aminobutyric acid, bacteriocins, conjugated linoleic acid, dietary fibers, phytosterols, oligosaccharides, prebiotic compounds etc present in fermented foods are known to improve digestion, immunity, suppress cancers, reduces cholesterol, blood glucose level, lactose intolerance, inhibit pathogens and also reduce the risk of CVD, liver diseases and chronic renal impairment. They also enhance the antioxidant activity of the foods and improve bone health and prevent osteoporosis, besides, regulating hormonal, neurological, immunological, gastrointestinal and ACE-inhibitory activities. Though, these fermented foods and beverages provide a range of health benefits to the consumers, their safety, in terms of plant or animal-based toxins, protein inhibitors, saponins, tannins and microbial-derived biogenic amines and microbial toxins are an important issue. Above all, monitoring their quality and safety are of utmost concern so as to harness maximum health benefit from them.

SVN Vijayendra,
CSIR-CFTRI, Resource Centre, Hyderabad

Probiotics for gut health

Food is not only the source of nutrients, but also the major force that introduces microbes in the human intestine. The gut microbes vary according to the changes in food habits and environment which leads to the development of complex gut microbial ecosystem from infancy, early childhood to adult and other developmental stages. In the last few decades, health consciousness has modified food to enrich its nutritional quality and also use it for health purpose as a functional food. The inclusion of probiotics in diet enhance the organoleptic, nutritional and therapeutic properties of food. Probiotics are defined as live microorganisms which when administered in adequate amounts confer a health benefit on the host. These are responsible for the production of various metabolites such as amino acids, peptides, short chain fatty acids, vitamins, exopolysaccharides and several immune modulatory compounds. There are several probiotic cultures however, *bifidobacterial, lactobacilli* and *bacilli* are extensively used. The consumption of such functional foods enhances the gut flora and help in improvement of gut health and overall health vigor by enhancing the antioxidant, antidiabetic, antiallergic and immunomodulatory properties. At large, probiotic functional foods definitely are an important tool to improve the health through beneficial probiotic microorganisms.

Bhushan L Chaudhari,
North Maharashtra University Jalgaon

Immunity functional foods to fight Covid-19

Coronavirus has been spreading havoc around the world since its emergence and outbreak in China's Wuhan area in December 2019. Covid-19 is a viral respiratory infectious disease caused by the new strain of SARS-CoV-2 (severe acute respiratory syndrome coronavirus-2), responsible for symptoms like common cold, middle-east respiratory syndrome and severe acute respiratory syndrome etc. People who are older than 65 and those with diabetes, chronic lung disease, cancer, chronic kidney disease and obesity are more prone to severe COVID-19 and its respiratory complications. Old age coupled with these diseases weaken the immune system of infected person very quickly and responsible for the severe deterioration of health, most time leading to death. Evidences show that it is difficult for the viral load to enter into the system of people with strong immune health. Therefore, people with a proper immune system could tackle the virus and could recover after a fairly short period. This could be overcome by consumption of foods rich in nutritional components that boosts the human immune health. Recommended diet to improve the functioning of immune system includes vegetables, fruits, fruit juices, herbs and spices (antiviral agents and immunity boosters) etc. They contain high quantities of vitamins, minerals and phytochemicals and have positive effect on the human body by alleviating many chronic ailments like cardiovascular disease (CVD), diabetes, cancer etc. All these compounds work in such a way that they modify the metabolism or mechanism of the antigen, thus restricting the replication and production process of the virus.

Abhimanyu Thakur & Kritika Kaushal,
FST, Dr YSP UHF, Solan

Wild fruits: The mine of bioactive compounds

Wild fruits are a valuable source of food and medicine and are also considered an alternative source to achieve food security. These fruits have been considered an important source of food for mankind before the dawn of civilization and the domestication of the present-day fruits. Wild fruits have been found to contain higher amounts of bioactive compounds mainly polyphenols which are largely recognized as anti-inflammatory, antiviral, antimicrobial and antioxidant agents.These are grown in forest areas without any care and are an important source of livelihood for the poor communities, rural populations, particularly during critical food shortage and other extreme situations like natural calamities. Some of the important wild fruits like pomegranate, bael, aonla, yellow Himalayan raspberry, Indian jujube, chilgoza nut, Indian horse chestnut, box myrtle, mulberry, seedling mango and prickly pear are widely available in the hilly slopes of the forests ranging from 800-3300 metre elevations. Although, the commercial fruits contain all important bioactive compounds required for good health but wild fruits have been found to contain the healthy phytochemicals like vitamin C, folic acid, riboflavin, vitamin B_{12}, quercetin, anthocyanins, flavonoids etc at much higher level. Little attention has been given to these highly healthful fruits by the researchers and simultaneously, only a fraction of total potential has been tapped by local inhabitants without knowing their nutritional importance. Similarly, we also need to focus on the utilization of their processing bio-waste for the extraction of bioactive compounds like pectin, fiber and natural antioxidants like anthocyanins and polyphenols. Therefore, the above referred fruits besides, a dozen of other wild fruits is required to be cultivated under proper care for their further utilization in nutraceutical preparations and development of antioxidant rich products to be used for the prevention and cure of various chronic diseases.

Dr Narayan S Thakur,
FST, Dr YSP UHF, Solan

Patents by Solan FFAI members (filed/ published)

i. Invention: Instant sweetmeat from carrot pomace bio-waste. Published in the Patent Office Journal No.16/2020 dated 17/04/2020, Page No. 17127 (Filed in 2018, Application number 201811039417)

ii. Invention: Apple seed extractor. Published in the Patent Office Journal No. 27/2020 dated 03/07/2020, Page No. 25108 (Filed on 13/07/2018, Application number 201811026320A)

iii. Invention: Improved machine for osmotic dehydration (pilot plant). Filed on 02/12/2019 vide application number 201911049466 of the patent office

iv. Invention: A herbal formulation in lollipop form for paediatric use and method of preparing the same. Filed on 04/07/2020 vide application number 202011028518 of the patent office

v. Invention: Nutritious oat fortified fruit rolls and method thereof. Filed on 07/09/2020 vide application number 2020110338548 of the patent office

vi. Invention: Low calorie apple-*Aloe vera* spread and the method thereof. Filed on 18/12/2020 vide application number 202011055182 of the patent office

vii. Invention: Healthful rolls of apple pomace bio-waste and method thereof. Filed on 18/03/2021 vide application number 202111011583 of the patent office

viii. Invention: Protein enriched aloe vera-mango fruit energy bar and the method thereof. Filed on 02/04/2021 vide application number 202111015756 of the patent office

ix. Invention: Process of preparation of carrot juice concentrate and product thereof. Filed on 26/10/2021 vide application number 202111048886 of the patent office

Significant research publications of FFAI members (Last 2 Years)

i) Sharma R, Burang B, Kumar S, Sharma YP and Kumar V. 2021. Optimization of apricot blended *Aloe vera* based low-calorie beverage functionally enriched with aonla juice. *Journal of Food Science and Technology*, DOI: https://doi.org/10.1007/s13197-021-05216-z. (NAAS rating 7.95).

ii) Kaur J, Kumar V, Kumar S, Aggarwal P, Sharma K and Bhadariya V. 2021. Process optimization for the preparation of tea and fruit-oriented energy drink: a nutritional approach. Journal of *Food Processing and Preservation*, e15363 (NAAS rating 7.45)

iii) Hamid, Thakur NS, Thakur A and Kumar P. 2020. Effect of different drying modes on phenolics and antioxidant potential of different parts of wild pomegranate fruits. *Scientia Horticulturae*, 274: 109656 https://doi.org/10.1016/j.scienta.2020.109656 (NAAS rating 7.96)

iv) Hamid, Thakur NS and Thakur A. 2020. Microencapsulation of wild pomegranate flavedo phenolics by lyophilization: Effect of maltodextrin concentration, structural morphology, functional properties, elemental composition and ingredient for development of functional beverage. *LWT-Food Science and Technology*, 133: 110077 https://doi.org/10.1016/j.lwt.2020.110077 (NAAS rating 9.71)

v) Pinakin DJ, Kumar V, Kumar S, Kaur S, Prasad R and Sharma BR. 2020. Influence of pre-drying treatments on physico-chemical and phytochemical potential of dried mahua flowers. *Plant Foods for Human Nutrition*, 1-7 (NAAS rating 8.90)

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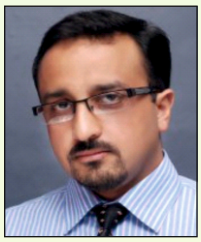

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