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CONTENTS

Theme: Food Technology and Management

Chhatrapati Shahu Institute of Business Education and Research (CSIBER)
(An Autonomous Institute)
University Road, Kolhapur- 416 004 Maharashtra State, India.

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University Road, Kolhapur – 416 004, Maharashtra, India
Ph: 91-231-2535706/07 Fax: 91-231-2535708 Website: www.siberindia.co.in
Email: sajmr@siberindia.co.in, sibersajmr@gmail.com

Editorial Note

In the last two decades India has experienced number of changes in the business and industrial environment. The New Reforms of 1991 has been able to provide a dynamic business environment that was lacking in the first five decades after independents. Accordingly new and hitherto unobserved business opportunities have emerged for budding entrepreneurs. The traditional and conventional business lines have taken a back seat. Sum of these emerging areas of business are outsourcing, consultancy, hospitality, tourism and others.

The Food Technology, Management and Food Services Sector also are under this important emerging area. Late Prof. Dr. A. D. Shinde, The Founder Director of CSIBER Trust, realized the importance of this field way back in early eighties. To realize his dream he started the College of Non-Conventional and Vocational Courses for Women (CNCVCW) at Kolhapur. He introduced innovative courses especially for women. These courses are skill oriented and help the women to find suitable placement in Food, Fashion and Interior Designing fields. At the same time they are equipped and trained to start their own business and become a source of employment for others in the society.

As a part of the academic responsibility and make the stakeholders aware about the recent trends in the three sectors, the college regularly conducts seminars, workshops and conferences. This year the college conducted a National level conference on the Recent Trends in Food Technology and Management on 28th and 29th March 2014. The conference received overwhelming response. There were almost 35 participants from different parts of the country presenting their research papers on different sub themes of the conference. In the poster presentation category there were almost 15 participants displaying their ideas and innovations in the area of Food and Management.

The topics covered in the papers submitted for the conference dealt with innovations in Food Processing industry, Bio technological aspects, Legal environment for food industry and the management trends in the sector. The national conference was able to attract good research papers on different themes from participants hailing from various states of our country. In the present issue we publish selected research papers of the conference. These papers will serve as an academic input for all those scholars interested in this specialized and emerging area.

Dr. T. V. G. Sarma
Editor

Keynote Address: Recent Trends in Food Technology

Dr. Vinay Oswal
Director - National Agriculture & Food Analysis and Research Institute (NAFARI) Pune - 411 002
Email : vinayoswal@gmail.com

1.0 INTRODUCTION

In today's world a food technologist gets to play a multi-faceted role, so very different from the past. Past means the 60s and the 70s when one hardly had the food industry other than some big names like Cadbury, Amul, Modern Bakery, Britannia or Parle. There were few jobs.

Today, many challenges face us creating more and more opportunities and interests. Yet, our country is still in the nascent stage of processing, except in some sectors where we have the latest capabilities, capacities and outputs.

Dairy is one such sector. Many processing units have come up across the country for other products as well. Specific zones have emerged for food processing, either because of raw material availability, or because of incentives, or may be because of the eco system that supports processing. Baddi, in Himachal, Rudrapuram in Uttarakhand, Pune- our region, Bangalore, Mysore and Hyderabad, all are emerging. And as I say we have a long way to go.

To give a glimpse, Pune region has over 1200 processing units. Our institute s created by the food industry to help the food industry. Some giants have emerged. The names include Venky's, GITS, Pravin, Weikfield, Chitales, Parampara, Rasoi Magic, Mother's Recipe, Gowardhan, Dynamics, Ferrero Rochers, Govind, Taj Frozen, Adinath Agro, Scandic Foods, Baramati Agro, Parakh Agro, Bake-lite, Mondelez and many more.

We process cereals, chocolates and confectionery, spices, ready-to-eat and ready-to-cook, flavours and colours, dairy, meat and poultry, fruits and vegetables, beverage, you name it, we have it. Drying, freezing, thermal processing, pickling or cold chain, we have it all.

In this developing world of opportunities, we have also to start looking at the key areas where the world is focussing. We review key focus areas, current technologies, upcoming technologies, and some interesting happenings.

These are the areas of Food security i.e. food for all inhabitants of the world. For the growing populations and the diminishing agricultural lands and water resources, the world bodies of food technologists are to play the key role in this area. Food losses due to mismanagement have to be minimised.

The second key area is Safe food production. Through food defence and through food safety management, it is a big challenge to ensure food

safety from farm to folk. Establishing traceability, process validations, analytical capabilities to detect and provide data for control and assurance, risk estimation and development of control mechanisms, effective management of pathogens and cross contamination possibilities, advanced cleaning and sanitation techniques.... Safe food production demands the food technologists to provide assurance. We are answerable to the retail marketers, to the governments, to the law, and to the consumers.

The third area is nutrition. Delivering nutrition of bio available nutrients and understanding bio chemistry and bio technology and looking for solutions to eliminate undesirable matter and facilitate desired nutrient, pose the challenge.

Engineering for efficient production, machine design, mechanisation, automation, process control, mechanisms, speed, documentation and record keeping, all are challenging. This is the fourth area.

2.0 CURRENT TRENDS

So, let us look at what are the new and current trends in the current technology.

While products have remained traditional, processing technologies have been emerging and changing, whether they were noodles done by hand or with simple tools or breads and cakes, desserts, beverages etc., from home made to micro and small industry, today large scale production still produce the traditional foods.

Typical technologies in use today are – Initial microbial load reduction using food grade sanitizers in mechanized operations, removal of respiratory heat by efficient chilling technologies, electronic eyes to remove defective, mechanized ways to size grade, magnetic and non magnetic sensing to alarm presence of metal, glass, rubber like materials, colour segregators, high speed pre-processing for peeling, dicing, controlled size reduction, milling, etc. Engineering design to handle varying size and shapes of produce and cutting, slitting with optical signals leading adjustment of blades to suit the profile of individual pieces at speed of few tons per hour! Super critical extractions, mechanical or solvent extractions have advanced.

Modifier for enhanced evaporation, mass transfer through maximized surface thin film creation, scraped surface and swept surface heating, multiple effect evaporation, drying by osmosis, or by sublimation, or vacuuming, vacuum frying, foam mat drying, fluidization for particulate drying, spray, dehumidifying etc are in use.

Thermal processing, agitating retorts, high speed filling, sealing that can handle liquid, solid and intermediate consistencies, sealing systems, packaging materials that can withstand temperatures, date coding at speeds of 2000 pieces per minute, exist. Instant quick freezing, plate freezing, have changed the world scene of ready to thaw, cook and serve snacks.

The future: Game changing technologies are set to come in.

Android, curved screens, virtual worlds, cloud computing, remote sensing, information management are going to change the definition of convenience.

i) Nanotechnology

Nanotechnology uses nano-scale particles created by milling, to break-down into fine, or by building back from individual atoms or molecules to self assemble. Currently, areas being explored are food packaging and pathogen detection, as well as, neutraciticals and functional foods. Encapulations of micro nutrients for targeted delivery, nano emulsions, masking of undesirable flavours, improved properties, are some of the applications. Nanotechnology is also being explored in development of nanosensors for detection of pathogenic bacteria and also for enzyme activity leading to better delivery of minerals and vitamins.

However, it is difficult to predict the long-term effects of nanotechnology. Concerns have been expressed on use of nanotechnology in food processing. Because of the small size of these nano-materials, the concern is that they may enter the food chain undetected, accumulate within tissues and organs, and can be taken up by individual cells. Therefore there are studies underway to analyse such risks and apply nanotechnology wisely.

ii) Novel sensing technology

Micro- and nano-based sensors utilize a variety of mechanisms to sense microbial and biochemical changes in food products. Non-contact ultrasound imaging technique can be used to detect foreign objects such as glass or bone fragments in boneless chicken or cheese. Spectroscopy methods, such as the Midinfrared Photoacoustic, Fourier Transform Raman and possibly Near Infrared can be used for rapid assessment of microbial contamination of food surfaces or packaging films.

iii) Optical biosensor (Surface Plasma Resonance)

Optical biosensors such as SPR (surface plasmon resonance) based pathogen detection systems provide for selective detection of microbial species. Mid-infrared biosensors, which combine bio-sensing and spectroscopy capabilities, may provide improved pathogen detection specificity.

In intelligent food packaging appropriate sensing technologies are required to detect substances in parts per trillion for food safety, quality and process control.

Development of new sensing devices may be achieved by taking advantage of miniaturization of electronics and nano-bio materials. These novel sensing systems can be used to facilitate on-line analysis of food stuffs. The devices can also be used to determine specific components in food and drinks such as sugars, proteins, vitamins and fats and to detect

and quantify chemical contaminants such as pesticides, heavy metals, and antibiotics.

They can also be used to detect pathogenic bacteria (E coli, Listeria, Salmonella, Campylobacter, Vibrio), viruses, toxins (Staphylococcus enterotoxins, Botulinum neurotoxins, Mycotoxins and Paralytic/ Diarrhetic shellfish toxins), and to monitor the freshness of aquatic foods including fish, and fermentation processes. The integration of biosensor with micro systems further revolutionizes the performance of these biosensors with respect to sensitivity and resolution, accuracy, repeatability, dynamic range, speed of response and cost.

iv) Advanced food processing techniques:

High Pressure Processing (HPP) is a mild method of preserving food products which also retains flavour and nutrients. It enables inactivation of microbes at pressures above 1000 psi

v) Pulse electric field

Pulsed electric field (PEF) food processing is a novel, non-thermal preservation method that has the potential to produce foods with excellent sensory and nutritional quality and shelf-life. Pulsed electric fields PEF is a non-thermal method of food preservation that uses short pulses of electricity for microbial inactivation and causes minimal detrimental effect on food quality attributes.

vi) Microwave Heating

Microwaves interact with polar water molecules and charged ions. The friction resulting from molecule alignment and migration of charged ions in rapidly alternating electromagnetic field generates heat within foods.

Most processed shelf-stable high moisture foods today are heat treated with pressurized hot water or steam to kill bacteria. Prolonged exposure to high temperature leads to poor product quality. Microwave sterilization is a thermal process that delivers thermal energy to foods under pressure to achieve inactivation of bacteria harmful for humans. Sharp reduction in processing time improves color, texture and other sensory attributes of foods while meeting microbial safety requirements.

vii) Bioactive Food Components

The term "bioactive food component" refers to nonessential biomolecules that are present in foods and exhibit the capacity to modulate one or more metabolic processes, which results in the promotion of better health. Bioactive food components are usually found in multiple forms such as glycosylated, esterifies, thiolyated, hydroxylated. Bioactive food components also have multiple metabolic activities allowing for beneficial effects in several diseases and target tissues. In general, it is thought that bioactive food components are predominantly found in plant foods such as whole grains, fruit, and vegetables. However, probiotics, conjugated linolenic acid, long-chain omega-3 polyunsaturated fatty acid, and bioactive peptides are most commonly found in animal products such as milk, fermented milk

products and cold-water fish.

viii) Genetically engineered food

Genetically engineered (GE) food is produced from plants, animals, and microbes that have had their genetic code modified by the selective introduction of specific DNA segments through the use of gene splicing. This process allows the organism to acquire a desirable trait such as pest protection, herbicide resistance, or improved nutritional qualities. Foods produced through genetic engineering or containing genetically engineered ingredients are also frequently known as bioengineered or genetically modified (GM) foods. Most of our food crops have been developed using traditional genetic modification techniques through plant breeding. Today's recombinant DNA techniques allow scientists to transfer desirable traits more rapidly, predictably, and precisely than when using the traditional breeding methods. The newer genetic modification techniques also enable scientists to develop traits that could not be introduced through customary plant breeding practices. The acceptability of genetically modified foods or foods with GM ingredients shall only be achieved by producing scientific evidences of food safety.

Certain natural food components that are deemed undesirable or perceived as deleterious to health can be removed or reduced to achieve healthier end products. For example, various processing procedures have been developed to remove caffeine from caffeine containing beverages or reduce anti-nutritive compounds from the natural food matrix. Artificial fats have been created to replace natural fats and oils for caloric reduction while still maintaining all the functional properties of natural lipids. Fermentation and enzymes can be used not only to break down toxic, allergenic, or anti-nutritive compounds in natural food materials, but also to enhance flavour and increase the bioavailability of essential nutrients.

Omega 3 fat, tocotrienols all are proving the need to redesign our food selection and healthy eating. Replacers for sugars, bulking agents, body modifiers and stabilizers, are setting the trend.

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