Indian Institute of Food Processing Technology

(Ministry of Food Processing Industries, Government of India)
Pudukkottai Road, Thanjavur, Tamil Nadu

Annual Report | वार्षिक रिपोर्ट
2019 – 20

भारतीय खाद्य प्रसंस्करण प्रौद्योगिकी संस्थान

(खाद्य प्रसंस्करण उद्योग मंत्रालय,भारत सरकार)
पुदुक्कोट्टई रोड, तंजावुर, तमिलनाडु

IIFPT

Foreword

The food processing sector plays a vital role in Our Country's economy. Processed food share is 32% in India's overall food market and is growing at a CAGR of 14.6%. It is one of the labour-intensive sectors which has an 11.6% share in total employment. Given its immense potential in value addition, the food processing sector has shown consistent performance in terms of high-growth and high-profit. The government of India, through the Ministry of Food Processing Industries (MoFPI), is making every effort to boost the growth and bring in more investments in the sector.

Indian Institute of Food Processing Technology (IIFPT) is a pioneer academic cum research & development institute functioning under the aegis of the Ministry of Food Processing Industries (MoFPI), Government of India. IIFPT is engaged in the Research & Development of food grain processing, value addition, by-product utilization, processing of food industry waste, new processes and products development, eco-friendly smart food packaging systems, smart warehouse management systems, computational modeling and nanoscale food processing, food 3D printing, food safety, and quality control systems. IIFPT offers various academic courses including B.Tech. (Food Technology), M.Tech (Food Technology) in Food Process Engineering, M.Tech (Food Technology) in Food Science & Technology, M.Tech (Food Technology) in Food Safety and Quality Assurance, Ph.D. (Food Technology) Food Process Engineering and Ph.D. (Food Technology) Food Science & Technology. The teaching laboratories are established with the most updated equipment capable of serving from the undergraduate level students to research scholars. The institute also has food testing facilities housing a NABL accredited food safety and quality testing laboratory, which also serves as an FSSAI referral laboratory. Incubation and training services are provided through a well-established Food Processing Business Incubation cum Training Centre (FPBIC). The institute also has its liaison offices at Guwahati in Assam and at Bathinda in Punjab, where training and extension activities are the major focus. IIFPT has signed formal agreements with major R&D organizations/Universities for collaborative research, student and faculty exchange programs.

As a result of our consistent efforts in providing quality higher education, IIFPT has secured 74th rank in National Institutional Ranking Framework (NIRF) 2020 among all Engineering colleges in India. IIFPT has also been branded as Band-A institution in the Atal Ranking of Institutions on Innovation and Achievements (ARIIA 2020). Our activities to enhance the income of villages through food processing got national level recognition from AICTE with Utkrisht Sansthan Vishwakarma Award 2019. IIFPT's food industry linkages helped our students to get placements in reputed companies/organizations. Our students got selected for their post-graduate studies in reputed top-ranked institutions in India and abroad. The institution is continuously serving farmers, entrepreneurs, and Self-help Groups by offering various training programs, consultancy services, and incubation services.

All these are possible by the dedicated teamwork of the IIFPT family and with the immense support of the Ministry of Food Processing Industries, GoI. I sincerely thank my IIFPT family members for their boundless support and wish to continue our march towards achieving excellence in the food processing sector.

Dr. C. Anandharamakrishnan
Director

IIFPT

Content

IIFPT

Introduction

Vision

"Focus on inclusive growth by accomplishing overall sustainability, safety and economic prosperity in the food sector"

Mission

- Undertaking demand driven research; cater to the needs of the stakeholders in food sector
- Creating industry-academic interface for problem solving and ad-hoc researches
- Creating string skilled human resource through value based education and training
- Enabling institutional collaborations for exchange of knowledge and human resources
- Serving the food sector stakeholders by providing analytical and consultancy services

Indian Institute of Food Processing Technology is a pioneer R & D and Educational Institution under the aegis of the Ministry of Food Processing Industries, Government of India, located at Thanjavur, Tamil Nadu. The Institute is in existence for 50 years and was formerly known as Paddy Processing Research Center (PPRC). In 2008, the Institute was renamed as Indian Institute of Crop Processing Technology and was upgraded as a National level Institute and later in March 2017, rechristened as Indian Institute of Food Processing Technology by Smt. Harsimrat Kaur Badal, Hon'ble Union Minister, Ministry of Food Processing Industries, GoI. The Hon'ble Minister in her address told "It is really a proud moment to rename IICPT to Indian Institute of Food Processing

Technology. With growing demands from various stakeholders, it is essential for this institute to broaden its work on all areas of the food processing sector. This will enable the Institute to align all its activities in accordance with the mission of the Ministry of Food Processing Industries, Government of India". The IIFPT with its new name diversify its prospects for intensive research and development activities in the areas of fish, meat, poultry and dairy processing. It takes up challenging issues on food packaging and testing services, nanotechnology, cold chain and logistics, computational modeling of food processing systems, 3-D printing of foods, fusion foods, designer foods and non-thermal food processing technologies.

The Institute began offering degree courses at graduate, post graduate and doctoral levels in Food Process Engineering from 2009-10 academic year. The intake of students includes 75 in B.Tech. Food Technology, 12 in each of the M.Tech. in Food Process Engineering, Food Science & Technology and Food Safety & Quality Assurance, 8 in Ph.D. Food Process Engineering, Food Science & Technology each. All the academic programs are affiliated to Tamil Nadu Agricultural University.

IIFPT has started a regional center at Guwahati to cater the needs of the stakeholders in the north-east region of the country. Another Liaison office was started at Bathinda to cater the needs of the farmers in Punjab. Through these centers, IIFPT serves to the farming community by providing training in the field of food processing using available resources in related areas. By these liaison offices, IIFPT expands its horizon and visibility to serve more to the stakeholders and disseminating the latest technologies to the unreached masses.

Infrastructure such as Food Processing Trainings cum Incubation Center, training class rooms, trainees' hostel and office room were established to serve for the stakeholders at the liaison offices of IIFPT at Guwahati, Assam and Bathinda, Punjab.

MoU – International

- Fruit Research Institute Cacak, Serbia

MoU – Educational Institutions

- PGP College of Arts & Science, Namakkal
- National Research Centre for Banana, Trichy
- Forum of Scheduled Caste & Scheduled Tribes Legislators & Parliamentarians and Dr. Ambedker Chamber of Commerce (FORUM & DACC), New Delhi
- Punjab Agricultural University, Ludhiana
- Maharaja Ranjit Singh Punjab Technical University, Bathinda
- National Dairy Research Institute, Karnal
- Central Institute of Post-Harvest Engineering & Technology, Ludhiana
- Indian Institute of Wheat & Barley Research, Karnal, Haryana
- Saint Longowal Institute of Engg. & Tech., Sangrur
- National Agri-Food Biotechnology Institute, Mohali
- Guru Nanak College, Budhlada

MoU – Industries

- Pasumai Biogreen India Pvt. Ltd. Chennai, Tamil Nadu

MoA – Industries

- M/s. Ten on Ten Mentoring & Advisory Services, Hyderabad
- Nutriplanet Foods Pvt. Ltd., Bengaluru
- TCG Foods Products, Chennai
- Coromandel International Ltd., Bio Product Division, Chennai
- Proharvest - Universal Enterprises, Bengaluru
- Shri Shri Shirdi SaiBaba Trust, Thanjavur
- Brihadeeswara Big Temple, Thanjavur
- Punnainallur Mariamman Temple, Arulmolipet, Thanjavur


Our Services
Testing, Incubation and Consultancy Services
Customised Consultancy Services
Food Processing Business Incubation Centre
NABL Accredited & FSSAI Referral Food Laboratory
Incubation facilities for entrepreneurs
Skill Development and Outreach
Mobile Food Testing Laboratory
Technical know-how & technology transfer
Short-term & Long-term Skill Development Trainings
Mobile Food Processing Facility
Education and HRD
B.Tech., M.Tech. & Ph.D. Courses Affiliated with TNAU
MoUs with 16 Universities Aboard and 82 National Collaborations
Excellent Placements
Excellent Exposure Opportunities through Student Exchange Programmes
Research and Development
Mission Mode Projects (Onion, Coconut and Tomato)
International Collaboration and External Funded Projects
Industry-Institute Tie-up Projects
Unique Research Areas
Paddy Processing
Non-Destructive Quality Testing
Non-Thermal Food Processing
Grain Storage Techniques
Glycemic index studies
Nano foods
Computational modeling

Awards

*IIFPT is awarded with **Utkrisht Sansthan Vishwakarma Award 2019** by AICTE for the exemplary contribution to enhance the income of villages through food processing.*

*IIFPT is awarded with **India Agribusiness Award 2019** by Indian Chamber of Food and Agriculture.*

*IIFPT is awarded with **Skilling India Summit & Awards 2019** by ASSOCHAM India for Best Institute – Innovation in Skill Development*

IIFPT is Ranked

74th

India Rankings 2020

Among all engineering colleges in India!

IIFPT @ Atal Ranking of Institutions on Innovation Achievements (ARIIA) 2020

Institution Innovation Council at IIFPT

New Facilities

Pilot ice cream plant of 100 Litres per batch capacity

Fruit beverages processing pilot plant of 100 litres per hour capacity

Virgin coconut oil plant of 1000 nuts per day capacity

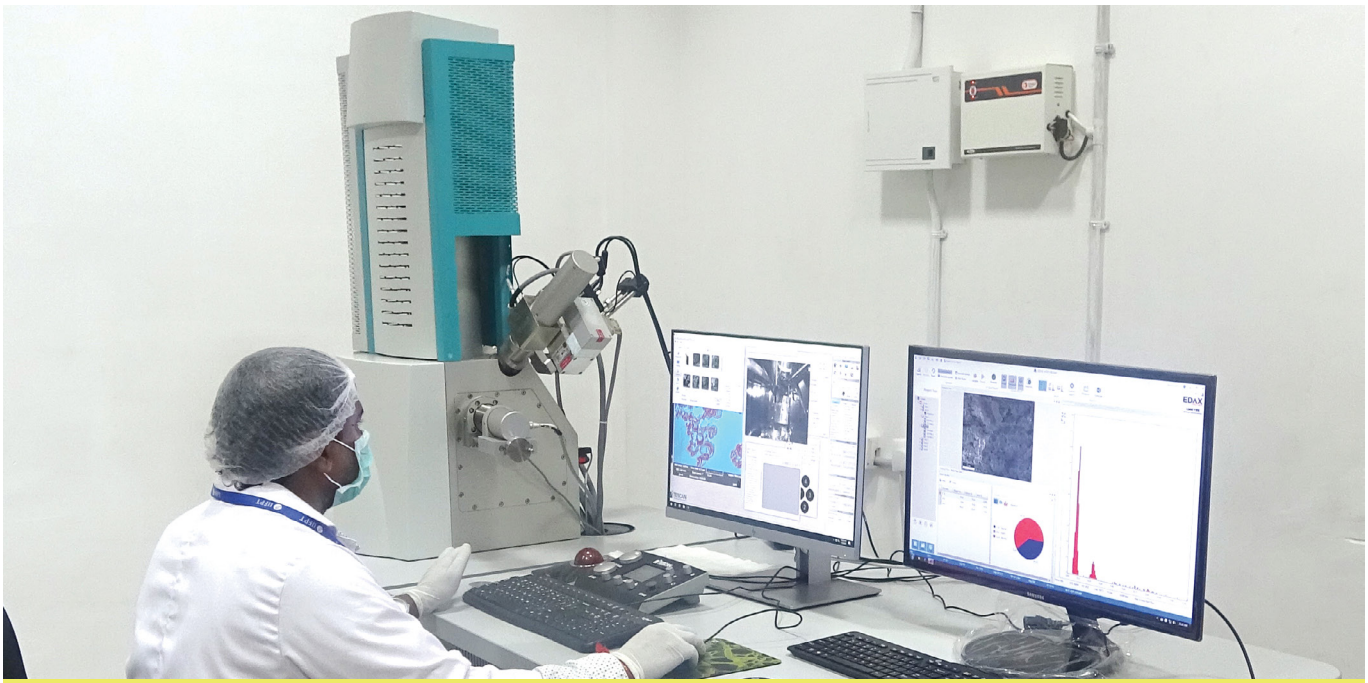
Cookies depositor with wire cutter

Pilot scale spray dryer of 3 kg/h capacity

Microbial identification system & Molecular testing facility

Multi Head 3D Food Printer

X-Ray Diffractometer - XPert^3 Powder



Scanning Electron Microscope - TESCAN Model VEGA3XMU

Center of Excellence in Grain Sciences

The Center of Excellence in Grain Sciences have organized the following event during the academic year 2019-2020..

1. National Workshop on "**Paddy Processing, Storage and value Addition**" held during 14th and 15th November, 2019. Representatives of various companies, organizations, rice millers, rice merchants, farmers from near and far participated in the workshop. 120 delegates participated in the workshop.

   The deliberation of the workshop are "Tiny to large scale drying and parboiling systems" by Er. Senguttuvan, Managing Partner, KS Engineering works, Thanjavur. "Value addition and opportunities for availing MSME or other funding for business" by Mr. Rajendran, legal advisor, Pavizham Rice mills, Kerala. "Quality assessment of paddy and rice specifications" by Dr. S. Sulochana, IIFPT. "Parboiling, drying, milling of paddy – cares to be taken for quality production of rice" by Dr. N. Venkatachalapathy, IIFPT. "Utilization of paddy by-products for enriching socio-economical health of rural life (Black ash utilization for banana cultivation-a novel method)" by Mr. Ravi Saroj, Head R & D, Chaman Lal Setia Exports Ltd., Haryana. "Utilization of rice milling by-products by Dr. R. Jaganmohan, IIFPT. "Technology for Modern Rice Milling" by Mr. Devaraj, Senior General manager, Buhler (India) Pvt ltd Bangalore. "Integrated pest management of paddy/rice" by Dr. R. Meenatchi, IIFPT. "New technological approach for rice milling – benefits, methods, and future trends" by Mr. Gyana Ranjan Mallik, Manager R & D, Fowler Westrup India Pvt Ltd, Bangalore. "Disinfestation of insects using Radio Frequency Technology", by Dr. S. Shanmugasundaram, IIFPT. "CFD modeling of grain storage ecosystem" by Dr. Jeyan Arthur Moses, IIFPT. "Insulated storage of paddy and aging of rice" by Dr. K. Singaravadivel, Independent Director at Tamil Nadu Food Grains Marketing Yard,

National Workshop on "Paddy Processing, Storage and value Addition" held during 14th and 15th November, 2019.

Canada and India Pulse Workshop: Strengthening Scientific Partnerships during 22nd and 23rd January, 2020

Madurai. "Value-added products from the rice" by Dr. Vincent Hema, IIFPT. "Export requirement of Organic rice certification" Mr. D. Gopalakrishnan, Organic Certification Inspector (Trichy Region), Tamil Nadu Organic Certification Department (TNOCD). Opportunity for incidental power generation in rice mill and Extraction of precipitated silica from rice husk ash by Mr. Rasool A.N, AGI Milltec Machinery Ltd., Bangalore. "Traditional rice varieties and their therapeutic values" by Dr. S. Sulochana, IIFPT. The final element of the workshop was a discussion on "Issues in rice milling industry" between the delegates, participants, guests and the IIFPT team members.

2. IIFPT in association with Agriculture and Argi-Food Canada (AAFC) organized "**Canada and India Pulse Workshop: Strengthening Scientific Partnerships**" during 22nd and 23rd January, 2020.

   Dr. Ramesh Vijayan, Scientist C, SERB, DST has presided as Guest of honour during the inaugural function. Dr. Sankaran KrishnaRaj, Agriculture and Agri-Food Canada (AAFC) has presented the aim of the workshop. He stressed upon R&D based on the industry needs and to address the commercial needs. Dr. Pitam Chandra, Ex-Director, ICAR-CIAE, Bhopal, during his chief guest address, He expressed the views on the decreasing trend of per capita availability of pulses over period of 50 years from 1950s to 2000 from 70g to 35g. Other delegates who participated in the workshop are Dr. Nandhakishore Rajagopalan, National Research Council (NRC), Canada. Dr.Kiran Sharma, Principal Scientist, ICRISAT. Dr. Sai Prasad, Head R&D, ITC Ltd. Dr. G.N. Hariharan, MSSRF, Chennai. Dr.Kalpana Platel, Principal Scientist (Retd.), CSIR-CFTRI. Dr. Sijo Joseph, AAFC, Canada. Dr. R. Ananthan, Scientist-D, Food Chemistry Division, National Institute of Nutrition (NIN). Mr. P. Muthumaran Director, FSSAI, Chennai. Dr. Singaravadivel, Executive Director Tamil Nadu Food grains Madurai Marketing yard Ltd., Madurai. Mr. Yannik Melancon Agriculture and Agri-Food Canada (AAFC).

3. Center of Excellence in Grain Sciences have organized "**Training on value addition of millets, pulses and rice**" to the agronomist from Srinivasan Services Trust – TVS motors, during 27th to 31st January, 2020.

4. Center of Excellence in Grain Sciences have organized a training on "**Training on processing, storage and value addition of rice**", during 4th to 6th February, 2020. 15 rice millers from Kolhapur rice miller association participated in the workshop.

Academics

Programmes Offered

- B.Tech. (Food Technology)
- M.Tech. (Food Technology) in Food Process Engineering
- M.Tech (Food Technology) in Food Science & Technology
- M. Tech (Food Technology) in Food Safety & Quality Assurance
- Ph.D. (Food Technology) in Food Process Engineering
- Ph.D. (Food Technology) in Food Science & Technology
- Ph.D (Biotechnology)

The 11th batch of B.Tech (Food Technology) was started on 21.08.2019 and the PG programmes commenced on16.08.2019. This year onwards, the students intake has been scaled-up from 60 to 75. Along with the existing PG programmes, M.Tech in Food Safety and Quality Assurance and Ph.D in Food Science & Technology, were started towards achieving the goals of our country in the field of food processing. The intake strength was revised as 12 for each M.Tech programme and 8 for each Ph.D as per the norms of Tamil Nadu Agricultural University. EWS reservation scheme was introduced and followed from the academic year 2019-20 for all academic programmes. As of now, the total number of students in IIFPT is 328.

Director, IIFPT, Thanjavur is addressing the freshers and the parents during the welcoming function

Inauguration of Open Day 2019 by Chief Guest and other District officials

School students were felicitated by the Chief Guest on the Open Day event

Open Day 2019

In remembrance of our founder Director Dr. V. Subramanyan IIFPT has organized "Open Day 2019" on 15th and 16th September 2019 . The event emphasized the need and importance of processing technology in food sector through a wide range of stalls, demonstrations, cultural shows, and a national level science exhibition. More than 20,000 people including 12,000 students visited the institute for the two days event.

Some of the captures of events of Open Day 2019

Students Welcome Party 2019

The institute has conducted formal welcome party for the 1st year B.Tech students during the beginning of the academic session, the welcome party from student side was organized during mid October. The senior batch students indulged in various activities to engage the new comers technically and made the events a thought provoking and mind kindling function helping the fresher to gel with the existing students.

Head, A&HRD, IIFPT, Thanjavur is addressing the students during the welcoming ceremony

World Food Day 2019

World Food Day is celebrated annually on 16 October across the globe to create awareness for those suffer from hunger, to ensure the need for food security and nutritious diets for all. Every year IIFPT celebrates "World Food Day" on the 16th of October. This year, IIFPT celebrated in a thoughtful manner by conducting programs like quizzes, debates and panel discussions that were based on a fully centralized theme on "Our Action are Our Future" organized by the students. The events are evident that IIFPT shapes the students into Managers, organisers besides their academic programs.

Director, IIFPT, Thanjavur chaired the students' debate on Non-Vegetarian vs Vegetarian diets during the world food day function

One of the student presenting the various food habits of India

Sports attainments

In addition to the academic activities the institute also encourages the students on sports activity. The students participated various sports either as a team or individually. IIFPT have performed remarkably in the Inter Collegiate Tournament held during 19th - 24th December 2019 at Tamil Nadu Agricultural University Coimbatore, as a zenith, the institute basket ball team secured runner-up position and won silver medal in the event.

IIFPT Basket ball team receiving Runner-up medals at Valedictory of ICT 2019

Cultural events

IIFPT has started a remarkable event 'iFESTY', an inter collegiate cultural fest from this year onwards. Students from more than 50 colleges participated in various events and exhibited the talents. The iFESTY was inaugurated by the Director, IIFPT with unveiling the Overall championship trophy. Mr. Sargunam, Tamil Film Director presided as chief guest of the programme and felicitated the participants with awards and trophy during valedictory function. The pictures below are representations of the fabulous function.

Industrial Visit and Cultural Events Activities

Industrial Visit and Education Tour Activities

IV year students went on All India Study Tour in Feb' 2020. They had visited various Industries, Educational and R&D institutions across the country.

Students visit at ICAR-CPRI, Shimla

Students visit at Indian Institute of Packaging, Mumbai

Industrial Visits

Students of B.Tech and M.Tech are visiting various food processing industries and institutions as per the course curriculum and learnt practical experience in the field of food processing.

III year students visitng District Level Sewage treatment facility at Thiruvarur

State Study Tour

State level study tour was organized for IV year students from 02.12.2019 to 11.12.2019. The students had visited various processing industries across the state of Kerala.

Student visit at Pavizham Rice Mill

Student visit at Koncor Ingredients Ltd.

Scholarships & Awards to Students

IIFPT offers the following scholarships and awards to students based on merit cum means.

- **Institute Merit-cum-Means Scholarship** for 5 students from each batch @ Rs.1,000/- p.m.
- **Institute free studentship** for one student per batch @ Rs.5000/- per semester
- **Institute Notional Prize:** A notional prize of Rs.5000/- (One-time award) and a certificate of merit for each batch from 2nd to 4th year based on ranking in the previous year
- **Anil Adlaka Scholarship:** For the meritorious student in the 2nd year UG program. The award carries a scholarship amount of Rs.10,000/- per annum
- **MoFPI Scholarship:** Rs.10,000 per month for M.Tech students and Rs.15,000 per month for Research Scholars

CSIR –Fellowship Awardees

Sundus Nida
Ph.D (FPE)

Kusuma Waded
Ph.D (FPE)

Mohan Naik G.
Ph.D (FPE)

Yoha K S
Ph.D (Biotechnology)

IIFPT

Placements

B.Tech – Food Process Engineering

No. of Students Placed in **Food Industries**	10	No. of Students Secured a Seat for **Higher Studies**	31

M.Tech – Food Process Engineering & Food Science & Technology

No. of Students Placed in **Food Industries**	18	No. of Students Secured a Seat for **Higher Studies**	19

Name of the Industries Hired IIFPT Students for Placement & Internship:

ITC Foods Ltd. Bangalore	Symega Ltd.Cochin
Nestle India Ltd, Goa	Flipkart, Bangalore
Nestle R&D, Gurugram	ID Fresh, Bangalore
MTR Foods, Bangalore	Parisons Ltd., Calicut
OLAM, Bangalore	BL Enterprise, Moradabad
Britannia Industries Ltd, Bangalore	Crust & Crumbs,
AblnBev Charminar Breweries, Telangana	Mane, Hyderabad
TATA Smart Foods Pvt Ltd.	United Breweries, Chennai
Cavinkare Ltd.Chennai	Impelpro, Bangalore
Adani Wilmer Ltd., Ahemadabad	Print Pack Technologies Ltd, Bangalore
Bigbasket Ltd.Bangalore	GRB Foods, Hosur
Naga Ltd. Tamil Nadu	Godrej Tyson Foods Ltd, Bangalore
Aachi Masala Pvt. Ltd.	Hector Beverages, Mysore
Penver Products Pvt. Ltd. AP	Cothas Coffee Company, Bangalore
Hunger Box, Bangalore & Hyderabad	Varun Beverages Ltd., Sricity
South India Grain Corporation, Bangalore	Food Buddies, Chennai
Nutri Planet Foods, Bangalore	Kancor, Angamaly, Kerala

Major Institution were IIFPT Secured a Seat for Higher Studies:

University of Manitoba, Canada
University of Guleph, Canada
Kansas State University, US
University College of Dublin, Ireland
South China University of Technology, China
ICT, Mumbai
MANAGE, Hyderabad
Indian Institute of Food Processing Technology (IIFPT), Thanjavur
NIFTEM
NIAM, Jaipur
CFTRI, Mysore
TNAU, Coimbatore
IIT, Delhi
IIPM, Bangalore
BIMS, Trichy
IIM, Lucknow
Vaikunta Mehta National Institute of Co-operative Management (VAMNICOM), Pune
Coffee Board, Bangalore

IIFPT – FOOD INDUSTRY CONSULTATION MEET

A consultation meet was conducted in IIFPT with food industries on 8th November 2019. Dr.S.Ayyapan, Hon'ble Chancellor, Central Agricultural University, Imphal and Former DG, ICAR & Secretary, DARE chaired the consultation meet along with Mr.A.Simon, Chief Manager, Tata Global Beverages as Moderator. The meet started with lighting of the lamp followed by welcoming of the Chief Guest and other delegates. Dr.C.Anandharamakrishnan, Director, IIFPT delivered the welcome address and elaborated the agenda of the consultation meet. The meet started with the introduction of the delegates, followed by signing of MoUs & MoAs with various industries.

Opening remarks was given by the Chief Guest, Dr.Ayyapan, Hon'ble Chancellor, Central Agricultural University, Imphal and Former DG, ICAR & Secretary, DARE. He delivered his speech on 'Food for All: Connect and Converge', over which he emphasised on sustainable region specific technologies with suitability to States with application in field. He highlighted the need for mentoring the students for real life situation to perform in industries apart from routine knowledge and also to develop industry feasible fast track technologies. Further he emphasized on sharing all forms of resources by institute and industry, IP protection, safe food handling and storage, addressing hidden hunger and malnutrition, ecological foot print, need for global food system to address food waste, climate change and biotic stress leading to 'urban' migration, transformation of farmers to agripreneurs for doubling farmers income, development of organic farming, hydrophonics and nutrifarms, nano and functional foods with biofortification, improving livestock, aquatic foods and other secondary agriculture practices to make new products of high value. He suggested IIFPT to contribute more in connecting agriculture to food processing and nutrition through innovations and incubation support systems. He further emphasised on IoT in farming to enable smart farming.

Following opening remarks by the chief guest, Dr.C.Anandharamakrishnan, Director, IIFPT presented on the institutional research, activities and collaborations, after which a brainstorming session on roadmap for strengthening IIFPT-industry linkages was initiated with Mr.A.Simon, Chief Manager, Tata Global Beverages as Moderator on the following areas;

1. Utilizing food industry CSR funds for research.
2. Undertaking sponsored research projects and IP management.
3. Partnering for MoFPI R&D scheme.
4. Initiating industry collaborative research (eg. BIRAC schemes).
5. Funding for industry oriented Ph.D research (eg.PM fellowships).
6. Scholarships, internships and placements for students.
7. Proposals for new research arears for IIFPT – based on industry needs.

It was also suggested to analyse and bridge the gap existing between institute and industry, for swift timeline in development of technology and its transfer as industry needs innovation and quick solutions. In continuation with the recommendations of the moderator, the Chief Guest Dr.S.Ayappan provided his views and concluding remarks of the consultation meet. He aappreciated IIFPTs services and contribution to food processing sector. He emphasised to focus on solutions for reducing / degrading pesticide residues in food, application of capsule like packaging technology for food and entrusted industry to invest CSR funds in food research especially in institutes working in food processing sector like IIFPT. He suggested Institute to bring out talented students to work in rural India. He mentioned to upgrade the curriculum according to subject specialization for student's skill improvement. He motivated for continuous collaborations between IIFPT and industries.

Research & Development

IIFPT

Development of nanofiber incorporated hydrogel as a 3D scaffold for skin tissue growth

Research objectives

- Develop nanofiber reinforced hydrogel 3D scaffold to mimic the natural ECM of cells.
- *In vitro* 3D fibroblast tissue growth.
- Evaluation of *in vitro* 3D tissue constructed using nanofiber incorporated hydrogel scaffold with that of nanofiber and hydrogel scaffold.

Background of the research

Tissue engineering based on biomaterials scaffolds is a promising strategy to regenerate the damaged tissues and organs, which fails to heal by themselves. The natural Extra Cellular Matrix (ECM) of the cells is a nanocomposite matrix with a mixture of fibers, pores, and rigids, providing nanotopography for cell attachment, morphology control and to promote growth by proper transport of nutrients. Rapid advancements in nanotechnology led to the development of nanostructured biomaterials for better biomimetic of ECM towards the success of tissue engineering. Among the various scaffolds, nanofibers and hydrogels are most predominantly used scaffolds with their strengths and limitations, when combined gives synergistic benefit for successful tissue engineering.

Methods

To mimic nanotopography of ECM, nanocomposite scaffolds with hierarchical structure and defined porosity were prepared with nanofibers and hydrogels in a layer by layer approach using electrospinning and 3D printing technology. Further, curcumin and resveratrol, the potent anti-inflammatory and anti-microbial bioactives were incorporated in the nanofiber scaffold for sustained release and to promote wound healing. Electrospinning parameters were optimized to get nanofibers of ~ 430 nm dia. Gelatin hydrogel was prepared in 3D architecture at room temperature using extrusion-based 3D printing. Conditions were optimized to prepare nanocomposite scaffold with nanofiber and hydrogels in a layer by layer approach and defined porosity and structure using 3D printing and electrospinning.

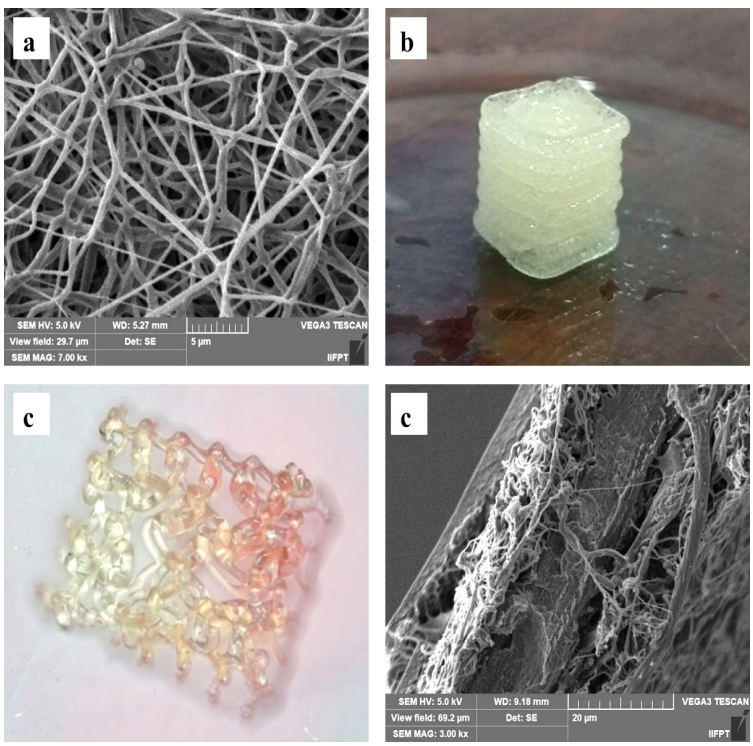


Fig. 1: Development of nanocomposite scaffolds: a) electrospun nanofibers; b) 3D printed gelatin hydrogel at RT; c) Nanofiber and hydrogel composite scaffold and d) SEM image of nanocomposite scaffold showing nanofibers and hydrogels in a layer by layer arrangement.

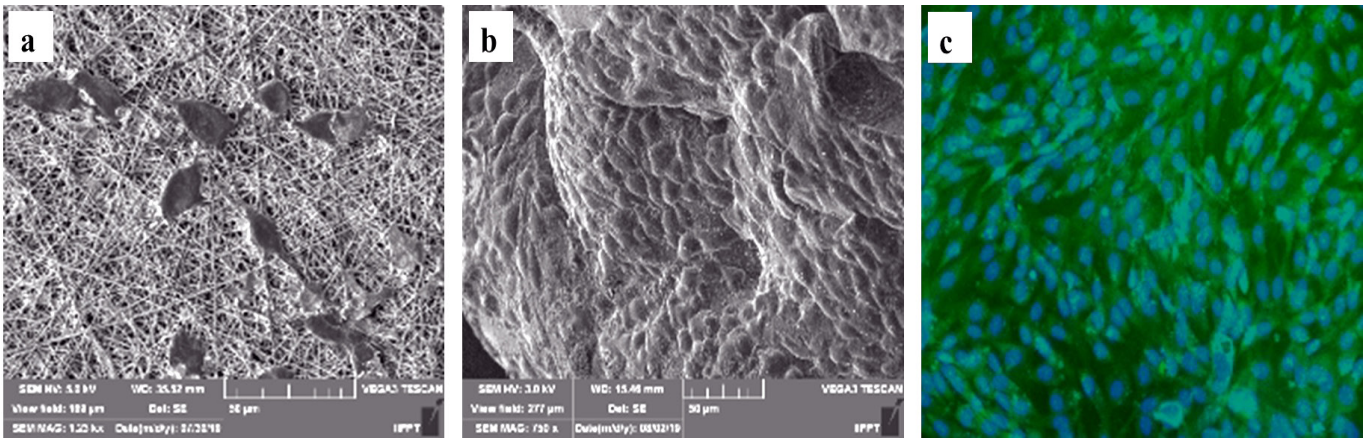


Fig. 2: NIH 3T3 fibroblast cell growth on nanocomposite scaffolds: SEM image of cells on a) nanofibers and b) hydrogel matrix; c) fluorescence imaging of fibroblasts cells on nanocomposite scaffolds.

Outcome of the research

Nanocomposite scaffold with nanofiber and hydrogels in a layer by layer (Fig. 1) arrangement which better mimics the nanotopography of nature ECM was developed. Prepared nanocomposite supports the growth of NIH 3T3 fibroblast cells (Fig. 2) for skin tissue engineering.

Development of micro/nano anacardic acid from cashew nut waste as an effective alternative to synthetic food preservatives

Research objectives

- To formulate anacardic acid in the form of micro/nano encapsulates using various compositions of Polyethylene glycol (PEG).
- To investigate the biocompatibility and bioactivity of encapsulated anacardic acid and its effects on foodborne microorganisms.
- To study the impact of micro/nano-anacardic acid as preservatives in the food system.
- To assess the up-regulation and down-regulation of the proposed micro/nano-anacardic acid in foodborne pathogens.

Background of the research

The interesting fact of cashew nut shell liquid is, it possesses a unique phenolic compound: anacardic acid with antibacterial, antifungal and antitumor properties. Hence, this project was framed to utilize the cashew wastage rich in anacardic acid, which can be formulated as the micro/nano form of food preservative for its application in biodegradable packaging materials.

Methods

Optimization of extraction protocol for extraction of anacardic acid from cashew nut shell liquid. Encapsulation of anacardic acid with a suitable polymer and its physio-chemical evaluation. Incorporation of encapsulated anacardic acid in suitable polymer composition and its basic characterization studies. Evaluation of anacardic acid incorporated packaging film for its anti-bacterial, anti-mold, and anti-browning property.

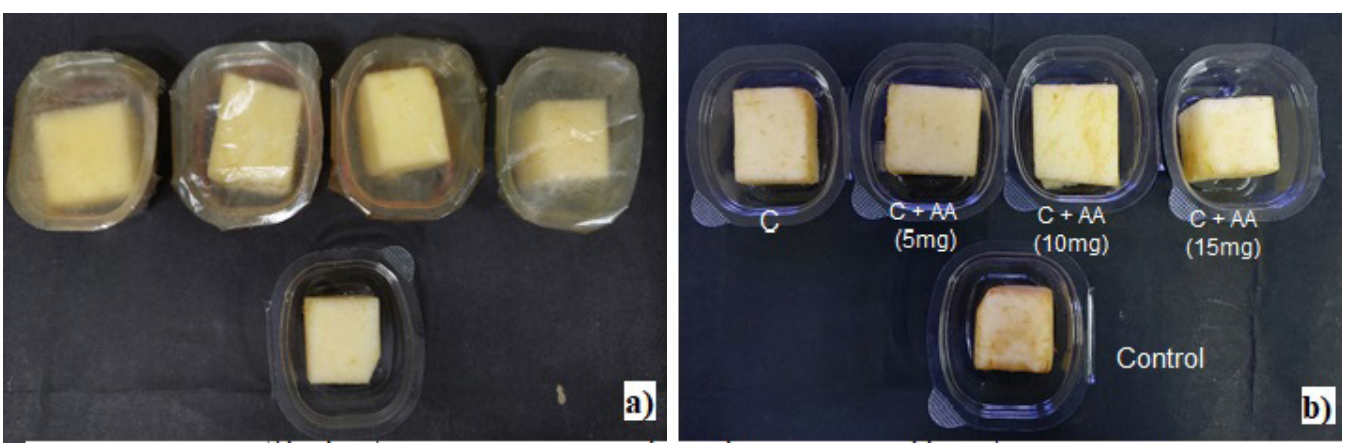


Fig. 1: Anti-browning property of anacardic acid incorporated biopolymer film in apples a) 0^{th} hour b) after 4^{th} hour.

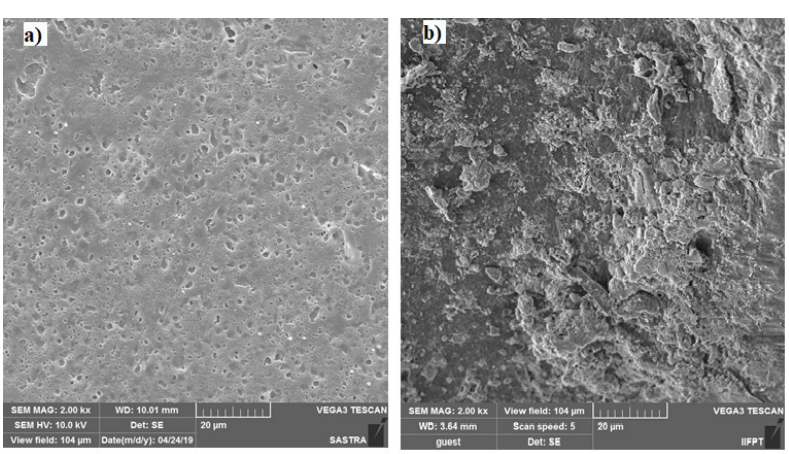


Fig. 2: SEM images biodegraded anacardic acid incorporated biopolymer film a) 0^{th} day and b) 60^{th} day

Outcome of the research

Through HPLC and GC-MS analysis, the cashew nut liquid extract showed about 75-78% of anacardic acid with potent antibacterial effect against food pathogens such as *Escherichia coli*, Listeria monocytogenes, *Streptococcus faecalis*, *Salmonella typhi* and *Shigella boydii*. The anacardic acid with three different concentrations 10, 15, and 20 mg was encapsulated with PEG 400 under sonication for 10 mins. The size and zeta potential for the encapsulated anacardic acid was found to be 300, 256.6, 362.2 nm with the zeta potential of -27.2, -22.7, and -16.5 mV respectively. Packing material was prepared with the encapsulated anacardic acid (10 mg, 15 mg, and 20 mg) along with different combinations of polymers, (Chitosan alone, chitosan: gelatin: carboxymethyl cellulose and chitosan: gelatin). Packaging film prepared with anacardic acid-containing chitosan showed potent antibacterial activity against *Streptococcus faecalis* and *Shigella boydii* compared with others. The film also exhibits anti-browning property in cut apples and anti-mold activity in bread. The mechanical strength of the biopolymer was also found to be good. The biodegradation study also confirms that the anacardic acid incorporated film can easily biodegradable in the garden soil within 60 days. The application of anacardic acid extracted from the waste in packaging material will elicit changes in the food preservation that replace and reduce the risk if commercially available packaging materials.

Development of process for β-carotene-in-cyclodextrin-in-iron liposomes for delivery of nutritional supplements

Research objectives

- Optimization of process parameters for the formulation of iron liposome.
- Characterization of the iron liposome obtained at the optimized condition.
- Application of developed nanoencapsulates in liquid foods and to study its efficiency by in *vitro* methods.

Background of the research

Iron-deficiency leading to anaemia has become a global malaise, with India being no different. Ironically, the remedial measures are often inappropriate to counter this debility. Though not an epidemic, but its prevalence is none less, in both urban and rural localities, irrespective of societal, regional and geographic bias. According to Global Burden of Disease (GBD) survey, in the last decade, anaemia has remained as the most prevalent cause of disability in India across the age groups. Deficient vitamins such as Vit. A (β-carotene) are also on a record low, unfortunately due to lack of natural supplements in our deliberate attempt to unnecessarily emulate the western lifestyle of processed foods. As a circumventive measure, the present study envisages employing liposomal delivery of the iron and β-carotene through engineered food products, to ensure adequate encapsulation efficiency, bioavailability, and stability.

Methods

Encapsulation of iron in liposome was conducted by probe sonication method at 20 kHz for 6 min. For liposome formulation, the lipid phase was prepared using soya phosphatidylcholine (lecithin) and Tween 80, dissolved in ethanol; citric acid buffer (pH 6.8) was used as an aqueous phase. Process parameters, such as the volume of the aqueous phase, the ratio of lecithin and Tween in the lipid phase, and the amount of working iron were varied in three levels to obtain maximum encapsulation efficiency to achieve iron content equivalent to at least half of RDA in a single dosage. After liposome preparation, the solution containing both entrapped and non-encapsulated iron was subjected to dialysis to separate the non-encapsulated iron. The amount of encapsulated iron in liposome was estimated by the o-phenanthroline method. The iron liposome obtained at the optimized condition was incorporated in drinking water and subjected for further studies.

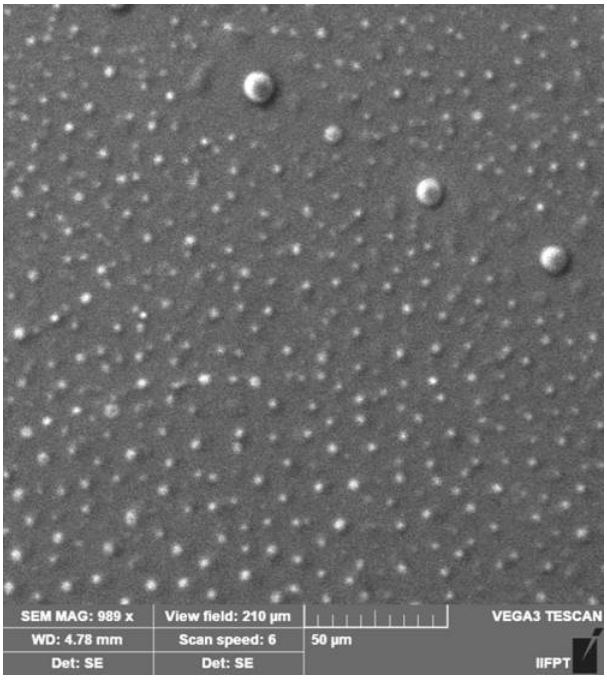


Fig. 1: SEM image of iron liposome

Outcome of the research

The study reports successful encapsulation of iron in liposome with encapsulation efficiency in the range of 60-80 %. The optimized condition of preparation of iron liposome was found to be lecithin: Tween 80= 1:0.8; 36 mg initial iron in the aqueous phase of 60 mL. The maximum encapsulation efficiency at this condition was 79.5±2.0 %. Multivariate ANOVA of the study showed that initial iron and volume of aqueous phase have a significant effect on the efficiency. However, there was no enhancement observed in the encapsulation efficiency with the increase in initial iron and volume of the aqueous phase. The scanning electron microscope (SEM) image of the liposome exhibited spherical morphology with 235 nm average particle diameter.

It is reported that the absorption of iron in ferrous form is higher in the human system compared to ferric and in this study, it was observed that the liposomal encapsulation prevented the oxidation of ferrous. It is also envisaged that sustained release of iron from this iron liposome will greatly reduce the side effects of iron supplementation. The study on the shelf-life of both the liposome and the water fortified with iron liposome is in process.

Research objectives

- To identify low-cost nutritious indigenous/ underutilized/ unexplored food sources as base materials for additive manufacturing.
- To develop and optimize conditions for 3-D printing of foods by integrating technologies like electrospinning and microencapsulation.
- To standardize formulations for new product development based on personalized dietary requirements.

Background of the research

Food 3D printing is an emerging concept in the food industry and is known to offer enhanced levels of product customization in terms of appearance as well as nutritional value. However, in the Indian context, no reports document the printability of foods, post-processing, and scaled-up applications. Accordingly, the focus of this research was to establish the 3D extrusion printability of different foods, aiming to come up with customized foods based on an individual's preference.

Methods

To evaluate the extrusion printability and to optimize printing conditions, a food 3D printer was fabricated. Various product and process variables were optimized for different food matrices. The post-processing step was also optimized for these products.

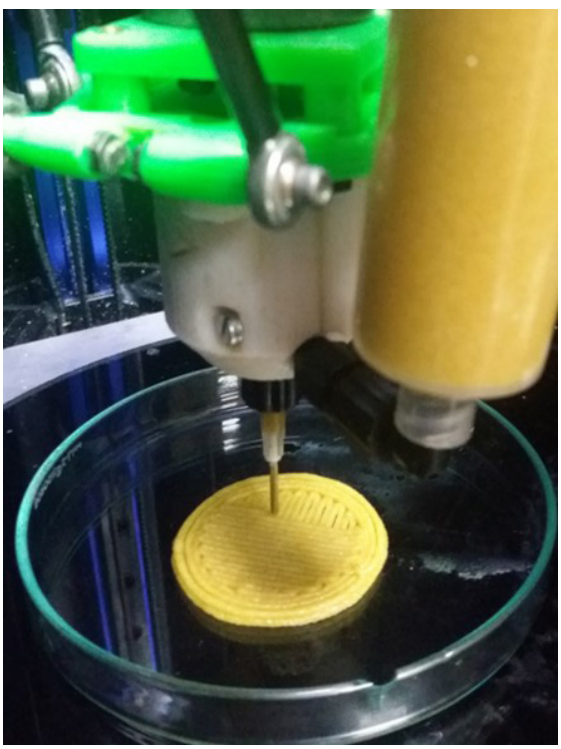


Fig. 1: 3D printer fabricated for this research

Fig. 2: Biodegradable 3D printed food package casing made from agri-wastes

Outcome of the research

Apart from the single head 3D food printer, another multi-head food 3D printer was fabricated. The process flow for food 3D printing for the following material supplies was optimized egg yolk and egg white, fibre, and protein rich composite flour, mushroom, rice starch, peel waste, chicken meat, and probiotics incorporated foods. The key

findings of these works were published in reputed journals and these are the first scientific publications on food 3D printing from India. These include optimization of rheological characteristics of the material supply, printing speed, motor speed, flow rates, and post-processing conditions.

Further, 3D printing technology was used to prepare food packaging cases from agricultural wastes such as sugarcane bagasse and rice husk. This provides new insights into the valourization of biomass wastes.

As an interesting extension of this study, we have attempted to explore the scope of 4D printing of foods. The findings of this research will be a valuable database for future research works in this field.

It is reported that the absorption of iron in ferrous form is higher in the human system compared to ferric and in this study, it was observed that the liposomal encapsulation prevented the oxidation of ferrous. It is also envisaged that sustained release of iron from this iron liposome will greatly reduce the side effects of iron supplementation. The study on the shelf-life of both the liposome and the water fortified with iron liposome is in process.

Research objectives

- To design and develop a non-thermal plasma system for sterilizing liquid food products.
- To study the effect of different plasma intensity on the sterilization of milk in terms of physical and chemical stability and microbial loads.
- To develop computational model for predicting the plasma dynamics to scale up the process suitable for industry.

Background of the research

Non thermal plasma is a versatile technology composed of ionized gas that has huge application on food sterilization, seed germination and quality maintenance. Liquid foods are indispensable thirst quenchers loaded with ample nutrients which deteriorate more easily without proper processing. Research on processing of liquid foods using non thermal methods are essential for maintaining the quality and fresh-like nature. However, only meagre research has been done on continuous processing (non-thermal) of liquids that could be used for industrial application.

Methods

Raw cow milk procured from the local vendor, Thanjavur, Tamil Nadu, was subjected to plasma treatment chamber. The indigenously developed DBD plasma system allows processing of liquids at atmospheric pressure while the plasma is produced at low pressure. The non-thermal plasma was characterized using the optical emission spectroscopy. The study was conducted for 2 kV and two different milk flow rates (3 and 6 ml/min) at a constant electrode distance of 1.5 cm. The processed milk and control samples were examined for natural microbial load, quality attributes and nutrient content.

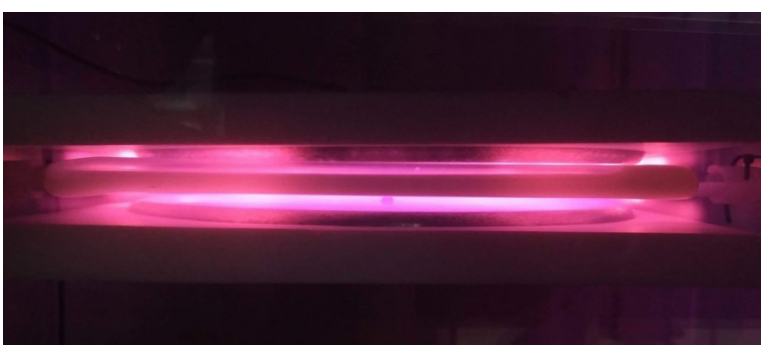


Fig. 1: Plasma exposure on milk

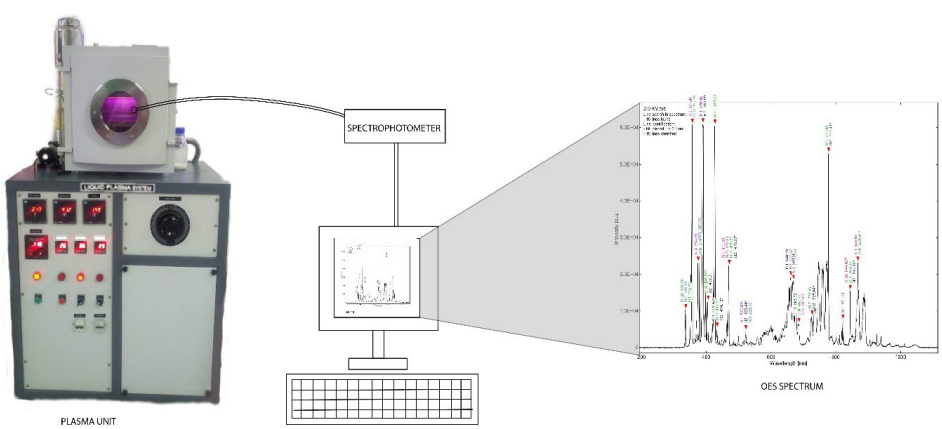


Fig. 2: Plasma characterization using optical emission spectrophotometer

Outcome of the research

The influence of non-thermal plasma on the continuous processing of cow milk was examined by studying and comparing the safety and quality attributes of processed milk with that of the control. The maximum reduction of natural *Escherichia* coli in milk after treatment was found to be approximately 95 % at the minimum flow rate of 3 ml/min which might be due to the effect of reactive species on *E. coli*. This was further validated by the presence of reactive oxygen and nitrogen species in the plasma and the increment in the conductivity of milk after plasma treatment. The physiochemical properties such as pH, viscosity, titratable acidity and color were also influenced to a minimum extent by the plasma treatment. Nutrient analysis further ensured that the plasma treatment doesn't had any significant effect of protein, lactose and calcium content. Thus, the study illustrates that the continuous decontamination of milk by cold plasma is a promising approach for processing without impacting the milk quality.

Indian patent has been filed on "Continuous low-pressure cold plasma unit for atmospheric decontamination of liquid foods".

(Application number: 202041008791)

Research objectives

- To develop a flexible bio-plastic from peanut shell powder and convert it into packaging material.
- To optimize the composition of the film-forming solution and film making conditions.
- To study the properties of the bio-plastic developed and assess the economic feasibility.

Background of the research

Peanut/ Groundnut *(Arachis hypogaea* L.*)* is one of the most largely produced and used agricultural species in the world. Though a very abundant waste, the use of peanut hulls has been limited. India is the second-largest producer of peanut, these wastes arise a serious concern to our environment. Peanut hulls are generally burnt by the farmers or arbitrarily dumped, which leads to the pollution of the environment. It is also used as a biofuel or cattle feed in some regions. Peanut hull is a high fibre product with 35-37% cellulose and 28-30% lignin content. Studies have proved that the fibre-rich compounds add to the mechanical strength and can be used as reinforcements in sustainable packaging systems. Moreover, the non-biodegradable wastes generated by various kinds of packaging materials has become a major threat to our environment. The need for cost-effective and sustainable variants are appending in the modern era. The bio-plastics generally derived from renewable sources are finding great applications in the food and pharmaceutical sector as replacements for conventional petroleum-based plastics.

Methods

Firstly, the peanut shells were cleaned, dried (< 5 % M.C) and powdered to a uniform size. The shell powder was then digested in an acidic solution. The film was prepared in a Carboxy Methyl Cellulose (CMC) matrix. Plasticizers and thickening agents were also added to the film-forming solution. The bio-plastic film was prepared by the solvent casting method. The best composition for the film was optimized by visual appearance and experimental optimization. The properties like colour, moisture content, thickness, total soluble matter, and tensile strength were evaluated.

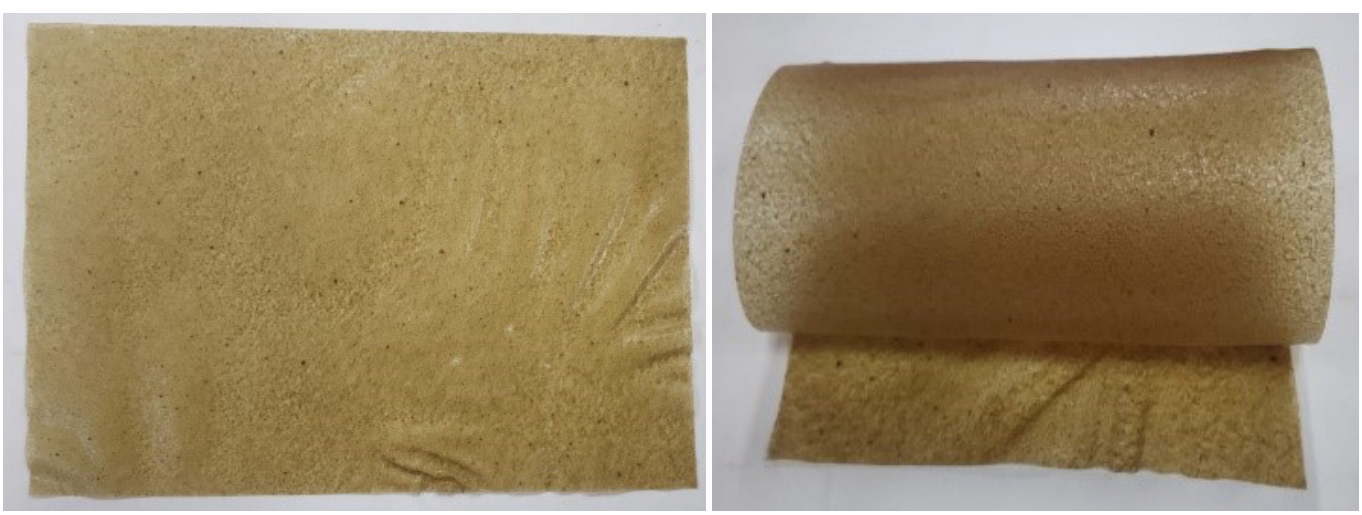


Fig. 1: Flexible biodegradable packaging material made from peanut shell

Conclusions

The developed film had a continuous smooth texture and it was flexible. The use of peanut shell as a whole with a simple procedure expands the possibility of commercial development of the prepared bio-plastic. It is evident from the experiments that corn starch was a better thickening agent for the developed film under the specified

conditions and it was more feasible economically. The water solubility of the film was significantly reduced with corn starch. Naturally derived laminations can be used to improve the moisture and vapour barrier properties of the bio-plastic.

Outcome of the research

Indian patent has been filed on "The process of manufacturing flexible biodegradable packaging material from peanut hulls and the product thereof".
(Application number: 202041004591)

Research objectives

- To develop a biodegradable packaging material from peanut shell.
- To work out the cost economics of the developed packaging material.
- To assist in the scaling up of a commercial packaging industry.

Background of the research

The demand for utilization of byproducts from food processing industries is appending these days. The feasibility of developing a flexible, biodegradable packaging material from peanut shells was studied previously. The developed film has to be improved and assessed for the properties and should be explored for the commercial scaling up.

Methods

Film was prepared from peanut shell powder (< 0.18 mm sieve size), after digestion using glacial acetic acid and hydrogen peroxide, in a Carboxymethyl cellulose matrix with thickening agents and plasticizers. Water insoluble coatings were given to the film to improve moisture and vapor barrier properties. The remaining of the peanut shell powder was utilized for paper making. Paper was made by cooking the peanut shells followed by bleaching and mixing with recycled paper in different proportions.

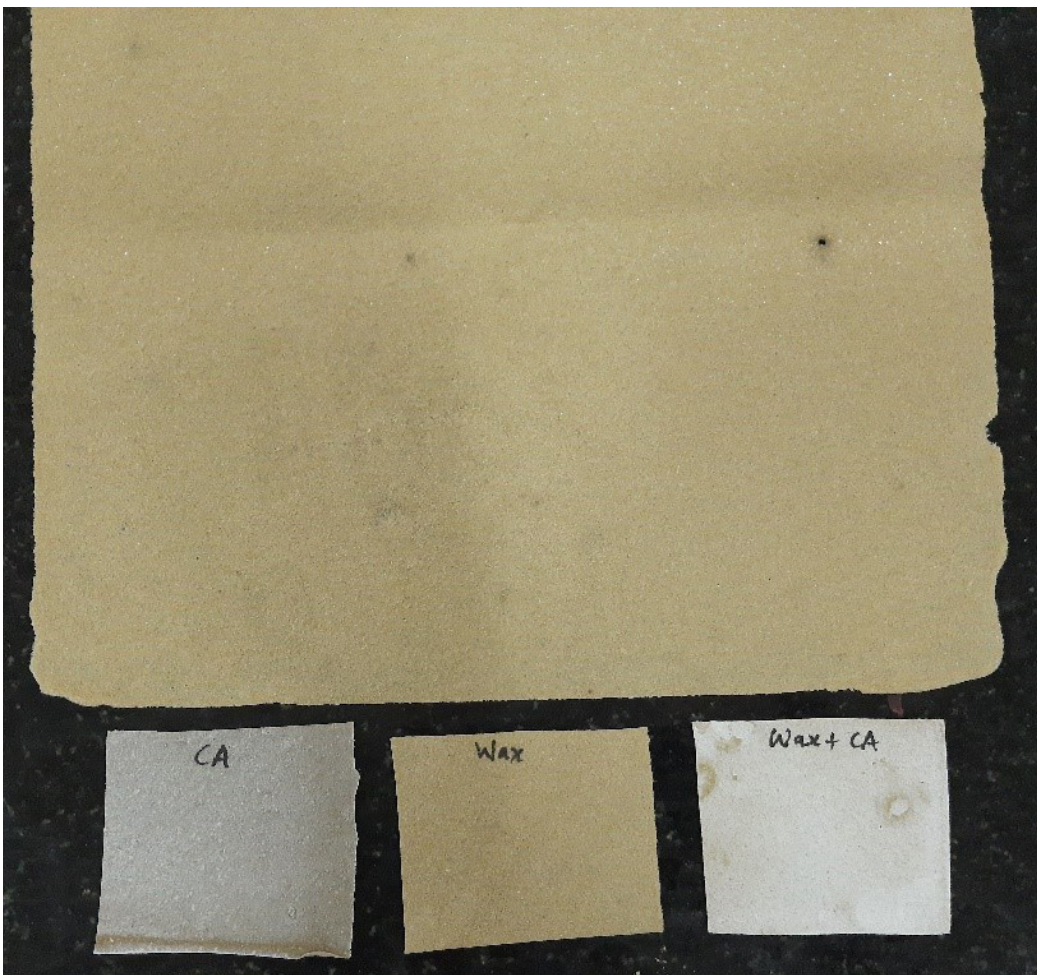


Fig. 1: Packaging film with and without coatings

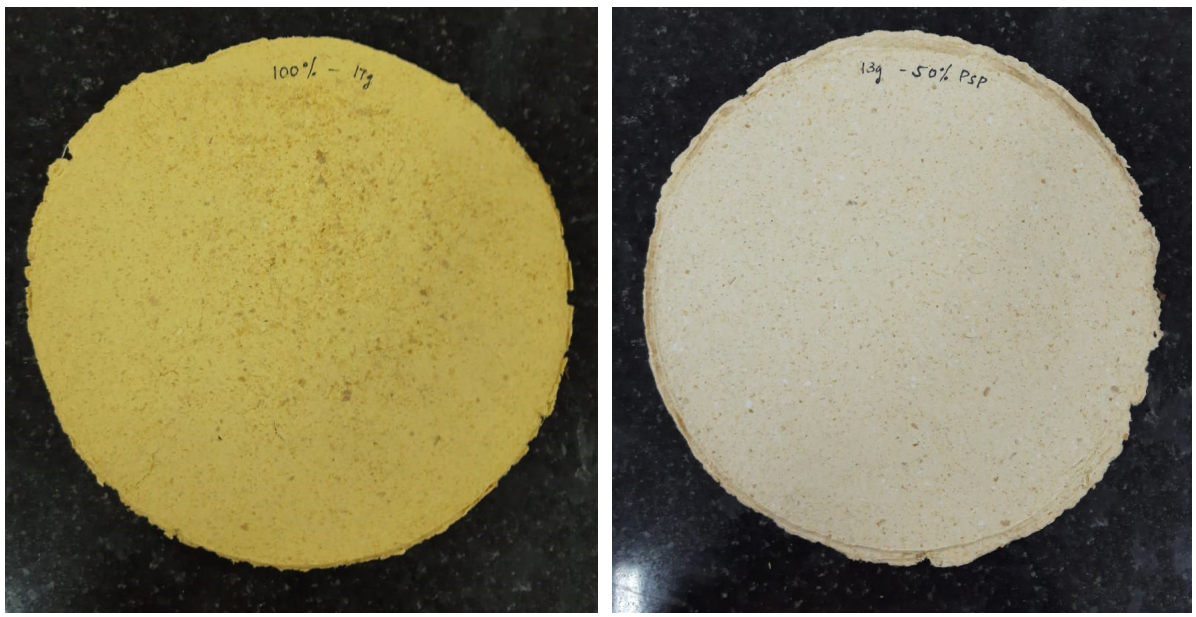


Fig. 2: Paper made from 100 % peanut shell powder (left) and 50 % PSP and 50 % recycled paper (right)

Outcome of the research

Packaging material was prepared by utilizing peanut shells and the properties were evaluated. Cost analysis, plant layout and mass balancing were done for the film preparation process

Design and Development of Solar Photovoltaic Cold Storage (PSCS) system

Research objectives

- To Design and implement energy efficient solar Powered Cold storage system for fruits and vegetables (NITT).
- To control the temperature and humidity for various fruits and vegetables under different operating conditions (NITT & IIFPT).
- Testing and demonstration of Solar Powered Cold Storage System for fruits and vegetables (IIFPT).

PSCS

A 2TR PSCS system has been fabricated with two cold rooms (with independent temperature and RH control) along with 5 kW solar panel for PSCS System. The Phase Change Material (PCM) is incorporated inside the cold room along with the evaporator for energy transferring as well as energy storage technology. PCM takes responsibility in the PSCS system for maintaining the temperature inside the cold room, when the compressor is switched off due to inadequate solar energy during night time. The efficacy of the fabricated 2TR PSCS system was tested with different conditions viz., PSCS system without solar and PCM (without power failure), without solar and PCM (with power failure), with solar, with PCM and with both solar and PCM.

Fig. 1: Fabricated prototype solar cold storage (PSCS) system

Outcome of the research

The experimental results of PSCS system showed that the PCM technology is capable of maintaining the set temperature for about 10 hours/day with the absence of solar/grid power.

The storage studies revealed that the shelf life of banana was extended up to 30 days stored at PSCS system with PCM, but the duration depends on the maturity of banana at the time of harvest.

Quality evaluation of litchi fruit using E-vision and E-nose system

Research objectives

- To develop a standalone system for litchi grading/classification based on external appearance and aroma quality parameter using Electronic Vision and Electronic Nose systems.
- To evaluate the performance of the developed system and develop concept for a continuous type prototype for litchi grading

Background of the research

Litchi (Litchi chinensis) is well known for its delightful taste, beauty, anti-carcinogenic properties and nutritional rich composition such as proteins, vitamins, amino acids and carbohydrates in the form of sugars. It is packed as individual fruits or bunches. Normally packing of good quality fruits ensure longer shelf life. Conventionally litchi is graded manually based on fruits and vegetables grading and marking rules (FVGMR), 2004 in combination with AGMARK criteria. The FVGMR criteria ensures the sound fruit without damage and uniform color and sweet aroma while AGMARK criteria (explained in section 9 e) ensures size classes. The conventional system of grading is either manual or only mechanical size grading. The colour and internal borer infection is not possible to incorporate in grading.

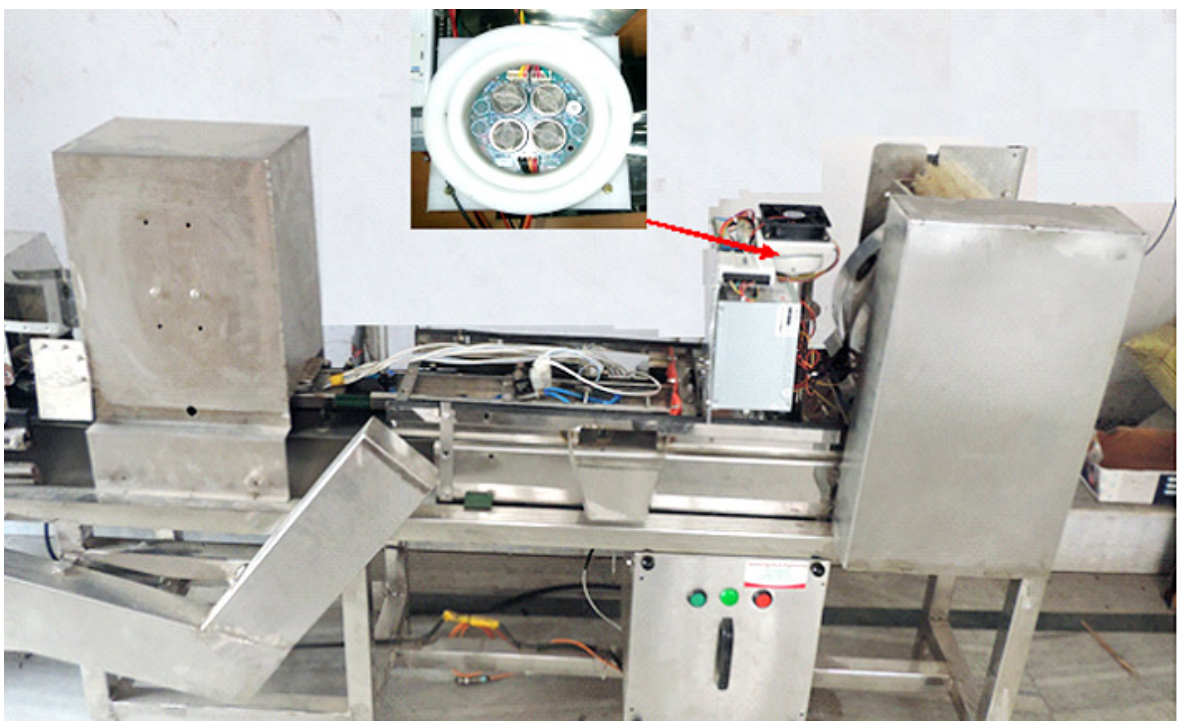
Hence, a system has been developed incorporating vision and artificial nose to grade litchi based on size colour and aroma which is capable to detect internal borer infected fruits.

Methods

Validation and testing of E-Vision system has been done in the first phase to get recommended physical parameters by FVGMR, 2004 by physically imaging the samples and taking sensorial data manually. These data is correlated with the image features to get relationship between manual and machine image features.

Litchi flavour components have also been measured by conventional method chemically based on which bio-sensors have been selected for the sensor array of E-Nose. Customized E-Nose unit is used to take the same fruit flavour signal and a correlation has been established for the detected flavour level of the fruit and their soundness.

Then a combination of both image and E-nose unit was used to grade litchi fruits into good (3 classes) and bad classes.



Outcome of the research

A conveyorised grading system for litchi has been developed capable of grading litchi fruits into sound classes, viz. Class I, II and II, and reject class using e vision and E-nose combined techniques.

Integrated Coconut Processing Unit for Continuous Removal of Shell, Testa Coconut Water and Dicing of Coconut Meat

Research objectives

- To design and develop a machinery for integrated coconut processing line (1000 nuts/day) - Sorting unit (200 nuts/h), De-shelling cum paring unit with coconut water collection, Copra Paring unit and Coconut meat/copra cutting/dicing unit.
- To evaluate the performance and workout the cost economics of the developed integrated processing line.
- To set up a pilot scale integrated coconut processing plant.

Background of the research

Automation plays an important role in the processing sector. The drawbacks such as high investment, additional manpower, time consumption, low efficiency machinery and unavailability of machinery for some unit operations were commonly facing by coconut processors. The available methods adopted for the process of grading, de-shelling and pairing, cutting etc., are either manual or semi-automatic and labour intensive. To overcome these problems, the project aims at the development of new and improved machinery for each unit operation which are fully automated, power operated and integrated as a complete coconut processing line.

Methods

Objective 1: An integrated coconut processing line which includes, development of sorting and grading unit, de-shelling unit, paring unit for fresh coconut meat & copra, coconut water collection unit and coconut meat/copra cutting unit.

Objective 2: The integrated line and the machinery developed will be evaluated for the performance (at laboratory and coconut farm-Field trail) and cost economics for the developed machinery will be worked out.

Objective 3: An integrated pilot scale coconut processing plant will be set up for demonstration and training to the stakeholders.

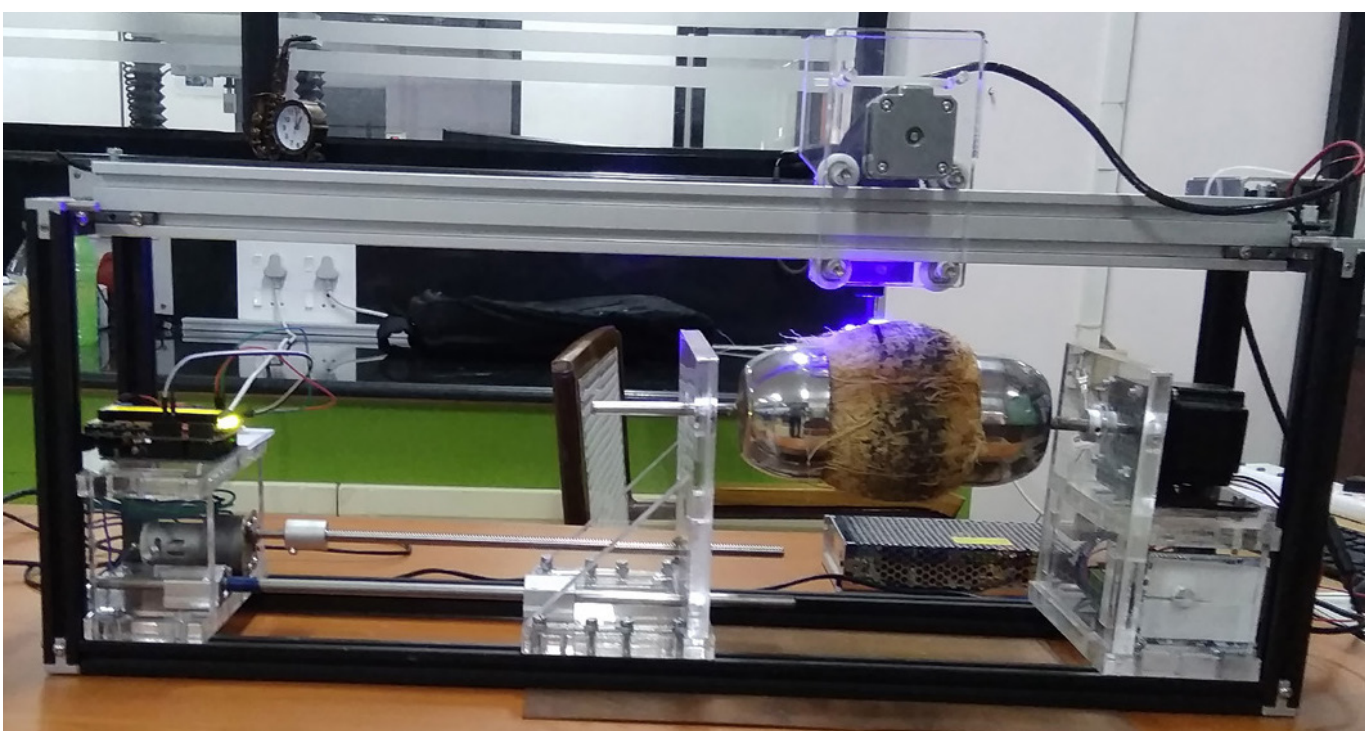


Fig. 1: Laser

Fig. 2: Dehusker

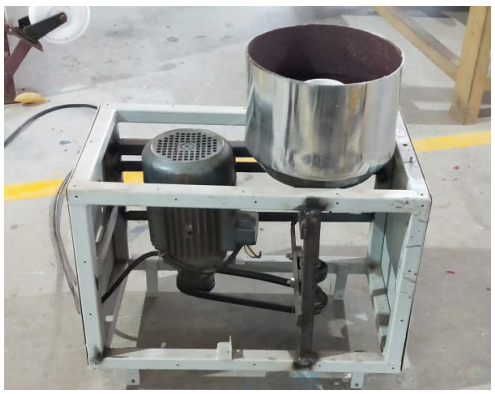


Fig. 3: Paring

Fig. 4: Sorter

Fig. 5: Water

Outcome of the research

Performance evaluation of de-husking machine was carried out successfully and engineering properties of de-husked coconut were measured. It was noticed that engineering properties significantly varied with type and variety of coconut. Mathematical approach has been used to grade (sort) the coconut. Fabrication was done and preliminary experiments were conducted. Conveyor system designed for feeding the coconut to sorter machine from de-husking machine and fabricated. An embedded based Coconut holding and rotary arrangement developed. Low power Laser cutting setup has developed and fabrication of portable laser cutting machine is done. Also, fabrication of High-power laser cutting machine is going on. Coconut water collection unit was fabricated and analyzed the quality of filtered coconut water. From the study it was noticed that filtration and UV treated sample has shelf life of up to 20 days with minimum changes in its characteristics whereas, control sample has up to 4 days. Changes in color, pH, TSS, titratable acidity, browning index was noticed throughout the shelf life. At day 20, total microbial counts exceeded the acceptable limit of ≤5000 cfu/ml except filtered and UV treated sample. Prototype of paring machine (patch type) has done. Continuous type coconut paring machine is designed and fabrication related work is going on.

Conclusions

Fabrication of coconut sorter, portable laser cutting machine, water collection unit and prototype of paring machine were done successfully. Testing of water collection system and quality evaluation of coconut water were done. By treating coconut water with spun+sediment filter and UV treatment for 14 sec holding time can preserve the coconut up to 20 days at refrigerated (6°C) storage condition. Fabrication of High-power laser cutting machine and continuous type coconut paring machine were going on. Testing and integration of all units and evaluation of integrated coconut processing unit is the future work.

Effective Utilization of Bio-waste from Small Onion in Food Processing Applications

Research objectives

- Extraction and characterization of dietary fibres, polysaccharides, quercetin (polyphenols) and volatile oil from the skin and stalk of the small onion.
- Application of the extracted compounds in various food products to improve its nutritional and functional properties.

Background of the research

During the onion production and processing a large quantity of waste streams viz. peel, stalk, flower and petiole are generated. Poor disposal of these waste streams causes severe environmental issue. Moreover, these waste streams were found to possess various functional properties and high fibre content. Considering these aspects the study is undertaken for the effective utilization of these shallot waste streams in different food systems.

Methods

The samples of shallot wastes were collected from Perambalur Farmers Producers Company, Chettikulam village, Perambalur district, Tamil Nadu, India. Iinitially the waste streams were assessed for microbial and chemical safety followed by proximate composition. Further, each waste streams were analyzed for different ingredients for their qualitative and quantitative aspects like fatty acid profiling, mineral profile and phytochemicals. The applicability of shallot waste in different food systems were analyzed by substituting either whole powder/ extracts into various food/ active packaging films. The functional properties of the flour were also analyzed to find the suitability for various applications.

Outcome of the research

The waste streams from the shallot were found to be safe based on the microbial, chemical and heavy metal analysis results. The proximate composition revealed that the fibre content is highest in all shallot waste streams (Fig 1). The shallot wastes contain glucose, fructose, maltose and sucrose. The fatty acid profile of onion waste revealed that shallot flower fat contains good amount of unsaturated fatty acids mainly linoleic acid (55.44%). The major compounds analysed as phytochemical is β-Sitosterol, an anti-inflammatory and anti-alzheimer steroid.

A spectrum of value added products were developed with different shallot waste streams and the details are given below.

- **Nutri cookies:** The cookies developed with direct substitution of all shallot waste powder after pre-treatment showed improvement in fibre content, mineral content, total phenol, flavonoid and antioxidant content.
- **Instant Soup Mix:** The onion powder was substituted by petiole powder completely in the soup mix, giving comparable consistency with high fibre content and lower calorie.
- **Seasoning Mix:** The peri-peri seasoning mix was developed by substituting whole onion powder with 25 % of shallot scape powder, gives low cost seasoning mix with better nutritional content.

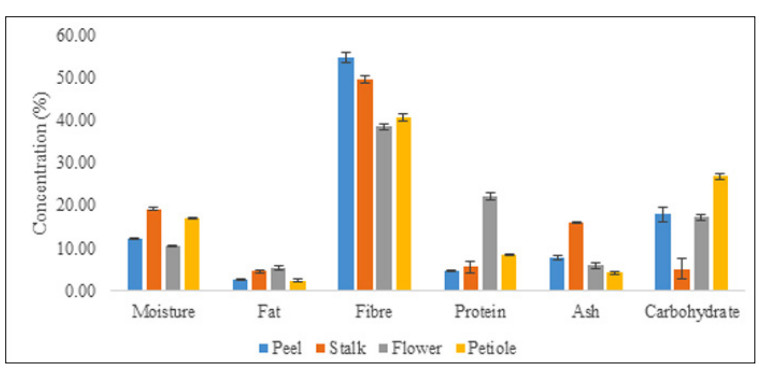


Fig. 1: Proximate composition of various waste streams

Fig. 2: Cookies developed with onion peel substitution

Fig. 3: Carrot and beet shreds packed in film developed with shallot waste

Fig. 4: Spectrum of products developed from different waste streams and extracted ingredients from shallot waste

- **Micro-Crystalline Cellulose Incorporated Yoghurt:** The extracted MCC was added to the yoghurt and the product with 1.5% of MCC in it showed better textural quality along with improved fibre content and also reduced syneresis.
- **Nutri Pasta:** The pasta was developed with aqueous extract of shallot waste streams and it showed improved antioxidant activity in the final product.
- **Packaging Film:** During the study for the preservation of tomato by shallot peel, the results revealed extended shelf life for tomatoes. Based on this study, the extracts were taken from different shallot waste and incorporated into packaging films to have active antimicrobial packaging.

Development of Active Intelligent packaging system with antimicrobial agent for fruits and vegetables

Research objectives

- Development of intelligent packaging system for fresh commodity (Tomato, Onion and Potato).
- Development of suitable antimicrobial packaging films for enhancing the shelf life of fresh cut commodities.
- Evaluation of the performance of developed packaging system in lab and field conditions.

Background of the research

Active packaging refers to the incorporation of certain additives into packaging film or within packaging containers with the aim of maintaining the quality and extending product shelf life. Intelligent packaging supports monitoring properties of the food during storage which is able to inform the manufacturer, retailer and consumer of the state of quality. Proper packaging is necessary because under normal conditions fruits generally dry rapidly and cause wilting and loss of rigidity. This project is aimed to suggest a suitable active intelligent packaging method for Tomato, Onion and Potato to avoid post-harvest losses in the supply chain market.

Methods

The physical, biochemical and physiological characteristics of tomato, potato and onion is calculated. The optimized packaging materials such as carton boxes with perforation, PVC container and thermal insulated containers were taken for conducting the storage studies at different environmental conditions. As per the respiration rate characteristics corresponding with maturity, weight and storage temperature the scavengers such as iron powder, silica gel and KMnO4 is added in to the packaging materials to make active packaging. For the intelligent packaging in the system a gas sensor was placed inside the thermal insulated box and the threshold level of above 1% CO_2 is fixed to monitor the quality of tomatoes through IoT setup conditions.

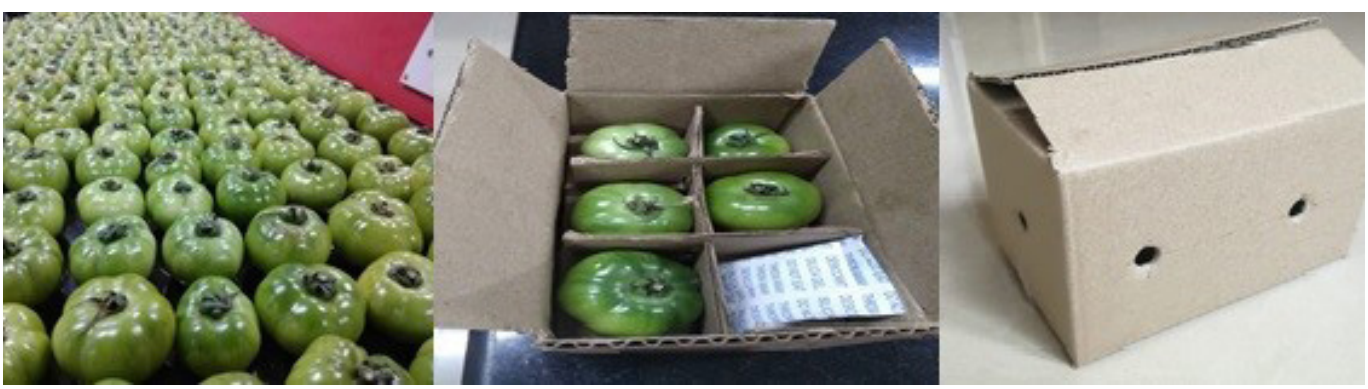


Fig. 1: Development of active packaging system for tomato

Fig. 2: Development of scavenger for active packaging of small onion

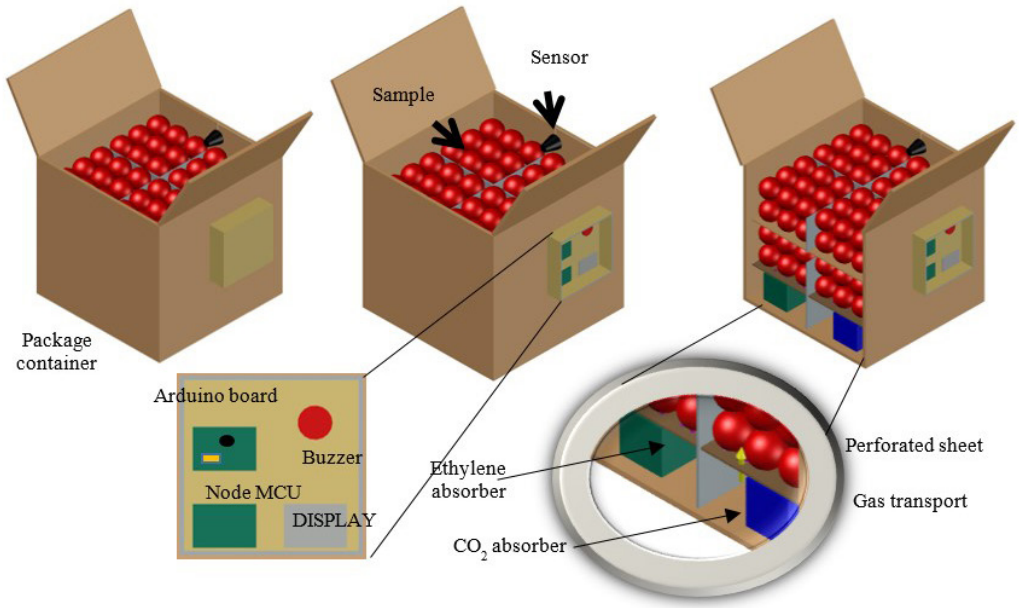


Fig. 3: Isometric view of active intelligent packaging for fresh commodity

Outcome of the research

Single fly corrugated carton boxes (16 × 10 × 10 cm) were selected. The individual boxes were partitioned with divider and have 12 sample holders. The partitions of the boxes were coated with 10% Aloe Vera gel, 1.5% Chitosan and 3% Garlic solution. 2-5% of the wall opening has been given to remove heat in the container. The fresh matured unripen tomatoes have weight each (54.58 gm), color a value (-4.2), bulk density (0.452 g/cm^3), texture (0.22 kgf), Total soluble solids (3.6°B) and pH 4.45 is measured at initial time of packaging. The respiration rate for tomato is calculated for 250 hrs and the final CO_2 and O_2 concentration in the package measured as 18.2 and 5.1 per cent respectively. The shelf life of unripen tomato is found as 30 days in the controlled conditions. similarly, the shelf life of ripened tomato is measured as 20 days. Packaging study for minimally processed onion and potato is calculated adopting vacuum packaging method along ethanol emitters. From the study it is observed that the peeled onion has shelf life of 15 days in refrigerated condition with 30% ethanol and the shelf life of sliced potato found as 12 days in vacuum packaging under refrigerated conditions.

Research objectives

- To evaluation of Dimensional and Physical properties of three millets namely Foxtail, Finger and sorghum at various moisture content i.e. 12%,14 %, and 16 % MC (db.).
- To determine the antioxidant coating of foxtail millets and its property evaluation in terms of physical, dimensional and cooking characteristics.

Background of the research

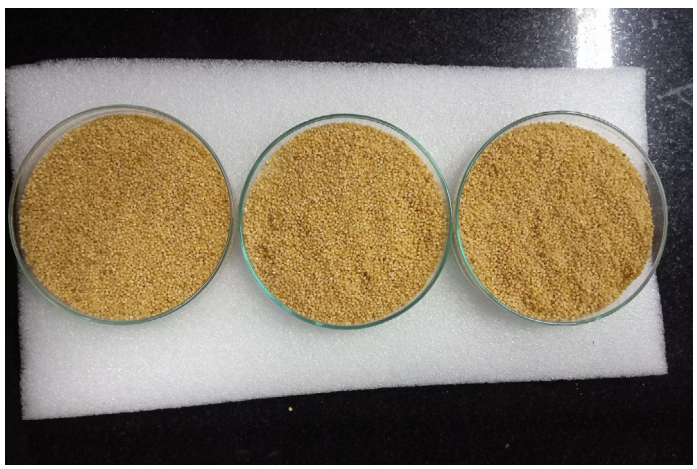
Millets were indeed one of the oldest foods known to humans but they were discarded in favor of wheat and rice with urbanization and industrialization. They are nutritionally superior to rice and wheat. The physical properties of millet, like those of other grains and seeds are essential for design of equipment used for their handling, storing and processing. Though the information on physical properties for many food grains is available, the information of these properties for minor millets at various moisture levels is lacking and hence this study was undertaken. These millets contain appreciable amounts of PUFA concentrated on the top layer of the milled grains which are involved in the development of rancidity on storage. Millet rice thus has a short shelf life. Edible coatings are generally defined as continuous matrices that can be prepared from edible materials. The question whether incorporation of natural antioxidants rich coatings on the millets brings about any change to its dimensional, physical and cooking quality needs to be answered. Thus, the effect of these on functional and cooking characteristics of edible coated Foxtail millet have been examined.

Methods

Independent variables are Raw materials (Foxtile millet, pearl millet and Finger millet), Moisture content (12 %,14 % and 16 %), Antioxidant extract (Green Tea extract, Cinnamon extract and Clove extract).

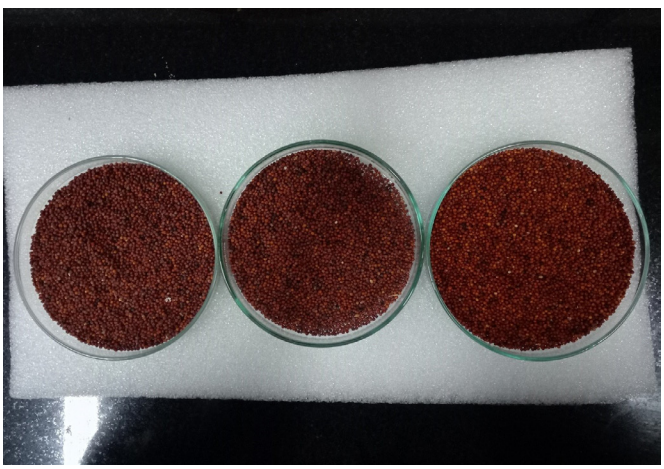
Dependent variables are Dimensional analysis (Length, Width, Thickness, Geometric mean diameter, arithmetic mean diameter and sphericity), Physical properties (Bulk density, angle of repose, 1000 grain weight, Color, coefficient of friction), and Hardness/fracture test/puncture strength, Cooking property (Cooking time, % of increases in weight, % of increases in volume). (Note: Research replication/experiment repetition is 3 times and Sample size of experiment is 100 gms per plate).

Antioxidant extract was prepared by aqueous extraction methods and 5% of extract was added to the 100 g of millet and dried followed by packing in EVAL and stored. The FFA and Pasting properties of the coated millets were evaluated at one month interval.



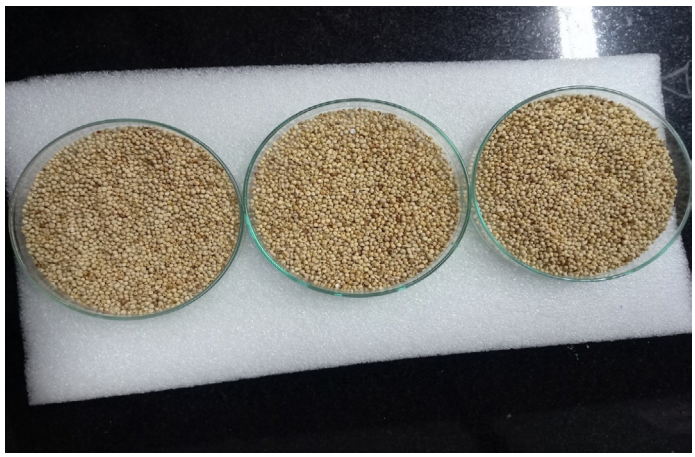
12 % M.C 14 % M.C 16 % M.C

Fig. 1: Foxtile millet at various moisture levels



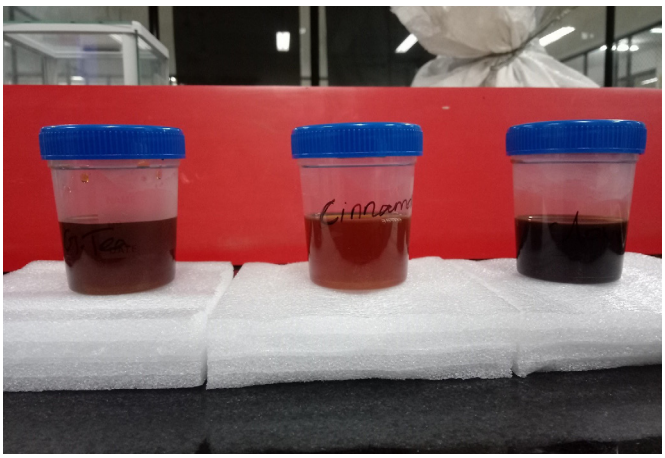
12 % M.C 14 % M.C 16 % M.C

Fig. 2: Finger millet at various moisture levels



12 % M.C 14 % M.C 16 % M.C

Fig. 3: Pearl millet at various moisture levels



Green tea extract Cinnamon extract Clove extract

Fig. 4: Antioxidant extract

Fig. 5: Antioxidant coated millets

Fig. 6: 25g of Antioxidant coated millet + 3 Tribolium castaneum insect

Outcome of the research

Dimensional properties:

Dimensional properties of the three millets at different moisture content were evaluated. In this, the length of the millets was 1.93 ± 0.11 to 1.97 ± 0.07, 2.4 ± 0.25 to 2.91 ± 0.19 and 1.63 ± 0.11 to 1.74 ± 0.12 mm for foxtail, pearl and finger millet respectively. In this, the width of the millets was 1.54 ± 0.08 to 1.6 ± 0.11, 2.4 ± 0.22 to 2.6 ± 0.23 and 1.63 ± 0.13 to 1.81 ± 0.07 mm for foxtail, pearl and finger millet respectively. In this, the Thickness of the millets was 1.029 ± 0.04to 1.045 ± 0.35, 2.106 ± 0.21 to 2.272 ± 0.15 and 1.404 ± 0.11 to 1.541 ± 0.15 mm for foxtail, pearl and finger millet respectively. In this, the Geometric mean diameter (mm) of the millets was 1.45 ± 0.05 to 1.48 ± 0.25, 2.29 ± 0.12 to 2.58 ± 0.11 and 1.55 ± 0.05 to 1.69 ± 0.04 mm for foxtail, pearl and finger millet respectively. In this, the Arithmetic mean diameter (mm) of the millets was 1.02 ± 0.11 to 1.08 ± 0.36, 4.04 ± 0.71 to 5.72 ± 0.31 and 1.24 ± 0.15 to 1.61 ± 0.16 mm for foxtail, pearl and finger millet respectively. In this, the Sphericity % of the millets was 76.44 ± 3.14 to 1.08 ± 0.36, 95.73 ± 3.23 to 88.68 ± 1.32 and 95.14 ± 0.91 to 97.30 ± 0.94 mm for foxtail, pearl and finger millet respectively. The variation in the dimensional properties are due to the behavior of moisture interaction.

Physical properties:

In this, the Bulk density (g/ml) of the millets was 0.801 ± 0.01 to 0.78 ± 0.02, 0.82 ± 0.02 to 0.69 ± 0.14 and 0.79 ± 0.01 to 0.74 ± 0.04 for foxtail, pearl and finger millet respectively. A linear decreasing trend with in bulk density, moisture content range of 12 to 16 % db was observed. Higher bulk density was exhibited by pearl millet followed by foxtail millet, and finger Millet. A similar relationship was reported by Shepherd and Bhardwaj (1986) and Dutta et al. (1988) for pigeon pea and gram, respectively. In this, the Angle of repose ^{o} of the millets was 56.824 ± 0.25 to 59.239 ± 0.70, 62.74 ± 0.25 to 63.45 ± 0.04 and 59.45 ± 0.31 to 60.45 ± 0.62 for foxtail, pearl and finger millet respectively. Angle of repose showed an increasing trend with moisture content. At lower moisture content, angle of repose was higher for foxtail millet followed by finger millet, and foxtail millet (Joshi et al. (1993)). In this, the Hardness kg of the millets was 3.82 ± 0.38 to 2.9 ± 0.39, 2.2 ± 0.07 to 1.94 ± 0.02 and 2.2 ± 0.23 to 1.34 ± 0.46 for foxtail, pearl and finger millet respectively. Hardness showed a decreasing trend with increase in moisture content. The millet exhibited higher hardness followed by foxtail, pearl and finger millets. The small rupturing forces at higher moisture content might have resulted from the fact that the seed became soft and more sensitive to cracking at high moisture. It indicates that greater force was necessary to rupture the seed with lower moisture (Kingsly et al. (2006)). The weights of 1000 seeds at 12 to 14 % db moisture content were in the range of 2.33 ± 0.01 to 2.58 ± 0.04, 7.48 ± 0.01 to 8.52 ± 0.05 and 2.84 ± 0.01 to 2.94 ± 0.01 g for Foxtail, Pearl and finger millets respectively. In this, the color L* of the millets was 58.497 ± 0.22 to 56.773 ± 0.12, 58.54 ± 0.40 to 59.74 ± 0.15 and 27.42 ± 0.21 to 25.34 ± 0.01 for foxtail, pearl and finger millet respectively. In this, the color a* of the millets was 7.69 ± 0.08 to 7.68 ± 0.08, 3.23 ± 0.10 to 2.89 ± 0.17 and 16.26 ± 0.49 to 19.68 ± 0.22 for foxtail, pearl and finger millet respectively. In this, the color b* of the millets was 35.21 ± 0.30 to 34.01 ± 0.29, 25.52 ± 0.03 to 25.74 ± 0.33 and 14.1 ± 0.52 to 25.27 ± 0.03 for foxtail, pearl and finger millet respectively. Similar results were found for coated millets. Thus, coating with different antioxidant rich ingredients resulted in lighter product. Lightness of the coated Italian millet can be attributed to larger air spaces between the particles when compared to uncoated foxtail millet.

Cooking properties:

In this, the Cooking Time (min) of the millets was 14.44 ± 0.47 to 11.33 ± 0.20. In this, the % increases of weight of the millets was 2.33 ± 0.36 to 2.58 ± 0.30. In this, the % increases of Volume of the millets was 2.72 ± 0.19 to 2.83 ± 0.14. In this, the Cooking Time (min) of the millets was 14.44 ± 0.47 for uncoated foxtail millet and was reduced 12.56 ± 0.23, 9.45 ± 0.41 and 11.73 ± 0.32 for GT, Cinnamon and Cloves respectively In this, the % increases of weight of the millets was 2.33 ± 0.36 for uncoated foxtail millet and was reduced 2.58 ± 0.25, 3.16 ± 0.64and 3.38 ± 0.34 for GT, Cinnamon and Cloves respectively. In this, the % increases of Volume of the millets was 2.72 ± 0.19 for uncoated foxtail millet and was reduced 2.86 ± 0.12, 2.81 ± 0.14 and 2.33 ± 0.21 for GT, Cinnamon and Cloves respectively. The type of coating influenced the cooking time in the order; green tea > clove > cinnamon. This could be attributed to its smaller size and therefore a larger surface area. The coating treatment further reduced the cooking time; this could be due to some alterations in the absorptive surface of the grain. Using edible coating in this study was a novel approach to incorporate antioxidant rich ingredients. As incorporation of these coatings did not bring about any undesirable changes in its functional and cooking characteristics it may be concluded that this approach may be acceptable for enhancing antioxidant content of foxtail millet without affecting its important quality. Since the least lipase activity was observed in grain samples, hence flour from these grains was evaluated to explain the starch pasting properties. The pasting properties depend on rigidity of starch potential and amount of amylose leached out in the solution. The pasting properties, viz., peak, breakdown, setback, and final viscosities was evaluated for coated millets at one month intervals. The decrease in viscosity after microwave heat treatment might be due to a breakdown of starch granules. This reported re-aggregation of starch granules. Breakdown viscosity is a measure of the ease with which the swollen granules can be disintegrated and setback indicates increase in viscosity that occurs on cooling of pasted starch. Significant reduction in breakdown and setback viscosities with increase in duration was also observed. Final viscosity, the ability of material to form viscous paste, decreased significantly with increase in duration. Although all observed pasting properties decreased significantly. Storage studies was ongoing process with different packaging materials.

Enhance the shelf life of selected green leafy vegetables

Research objectives

- To study the physical, chemical and microbial properties of selected green leafy vegetables (*Ama-ranthus* aritis, Moringa).
- Optimize the pretreatment method using ozone for handling of selected green leafy vegetables.
- To analyze the suitable packaging materials and methods for enhancing the shelf life of selected green leaves.

Background of the research

As demand for fresh cut leafy vegetables increases, growers and processed food producers continue to search for the ways to raise and market their products which can withstand lengthy in abusive conditions during the shipping & handling process, storage and display facilities. Hence the objective of this study is to provide postharvest technologies, handling and packaging recommendations for green leaves producer that sell directly to consumers as Ready to Cook (RTC) products with food safety standards.

Methods

The leaves of the vegetables were separated and washed with potable clean water. The washed green leaves were air dried in gentle manner for 20min in normal atmospheric conditions. A 50gms of leaves were filled in each pouches and trays for storage studies along with ethanol absorber. The packed vegetables were sealed with tray packing machine and band sealer respectively. Followed these materials were stored in refrigerated condition and ambient conditions. During the storage period the physical properties, weight loss, biochemical, microbial and sensory characteristics of leafy vegetables were analyzed.

Outcome of the Research

The shelf-life study of Amaranth sp,is done in both tray and pp commercialized films. Compared with tray, pp bags showed longer shelf life of about 15 days under refrigerated condition. The major deliverable of this project is optimized the low cost packaging methods for shelf life extension, Avoid the post-harvest losses of leafy vegetables in supply chain market and Supply of hygienic nutritious foods to the consumers.

Fig. 1: Active packaging of Green Leafy vegetables

Fig. 2: Minimally processed Leafy vegetables packed in commercial PP cover

Research objectives

- To find suitable food processing technique and preservation of Palm Neera.

Background of the research

Palms are one of the World oldest flowering plants. Since the ages, the young inflorescences of these palms are tapped for many by products such as Fresh juices, Toddy, Wine, Syrup, Sugar and Jaggery. Neera, a sap is traditionally tapped from its inflorescence i.e., spadix which is reportedly consumed by the locals of the rural areas is delicious as well as nutritious that is enriched with sugars, minerals, protein, antioxidants, vitamins, etc. But the fast rate of auto- fermentation changes this sap to a white color alcoholic drink with a foul smell. The fermented sap is known as 'toddy', which has a strong odor that makes it unpalatable despite being nutritious. The auto-fermentation nature of neera to toddy is the major constraint of Palm Neera industry. Hence, this study was focused to inhibit the fermentation of Palmyrah Neera by various physical, chemical and biological methods.

Methods

Palmyrah Palm Neera was collected from Thulukkampatti area of Thanjavur district, Tamil Nadu. Bark of Mesua ferrea was collected from Assam which has various nutraceutical and therapeutic benefits. Proximate analyses were carried out as per AOAC 21st edition 2019. TSS was determined with the help of hand refractometer of range 0-32°B. Functional groups changes made by $Ca(OH)_2$ on the Neera samples were analysed by Fourier transform infrared spectroscope (FTIR). Amino acids were determined by ultra-high performance liquid chromatography (UHPLC). Mineral profile was carried out by ICP- MS method. Total plate count was determined by IS 5402 method using plate count agar and yeast & mould count was determined by IS 5403 method. DNA quality was evaluated on 1.0 % agarose gel; a single band of high-molecular weight DNA has been observed. Fragment of 18S rRNA gene was amplified by NS1 and NS4 primers. Neera was treated with 0.2% $Ca(OH)_2$ and 2% bark extract of Mesua ferrea and a combination of both lime (0.2%) and Mesua ferrea bark extract (2%) was also taken in consideration as a treatment for the study. The shelf life study was carried out for one month after the addition of bark extract and five bottles were sealed in a lot after centrifugation (5000 rpm, 15min) and pasteurization (65°C, 20 min.) under ambient (37±2 °C) and refrigerated condition (4±2 °C).

Fig. 1: Neera collection

Fig. 2: Processed Neera

Outcome of the research

The analytical data of processed Neera confirmed it as a perfect vital health beverage. Essential amino acid Valine (11.739 mg/mL) was found to be the highest followed by Methionine (7.289 mg/mL) and Proline (2.433 mg/mL). ICP- MS study for mineral analysis showed the presence of Potassium (115mg/100mL) in highest amount in fresh Neera. FT-IR analysis confirmed that treated Neera samples were not changed chemically. One yeast colony was isolated from the fresh sap and identified by 18s rRNA based molecular method as Saccharomyces cerevisae which is a major fermentation inducing microorganism. Lime acted as a pH regulator. The yeast and mould count was observed to less than four (<4 cfu/mL) colonies in the treatment $Ca(OH)_2$ combined with bark extract and the refrigerated sample was having less than 6 bacterial colonies till 21 days. On 28^{th} day more than 10 colonies were observed. The sap treated with $Ca(OH)_2$ and bark extract showed effective result till 21^{st} day with alcohol % as 0 (zero) during the shelf life study. Therefore, slaked lime $Ca(OH)_2$ along with bark extract of Mesua ferrea bark can be recommended as an efficient fermentation inhibitor for the Palmyrah neera.

Research objectives

- To develop ampherometric biosensor for confirmative test of Virgin Coconut oil(VCO).
- To develop a capacitive type sensor for the detection of Peroxide value(PV) of Coconut oil (CO).
- Validation of the developed sensor with conventional methods.

Background of the research

Virgin Coconut oil (VCO) is opt for adulteration with coconut oil due to its cost. Diglyceride is the only parameter in VCO which can be used to identify adulteration with coconut oil. The existing analytical techniques used for the detection of the diglyceride content are based on HPLC and NMR.

During storage oils becomes rancid due to thermal oxidation and this can be expressed as peroxide value. Existing techniques used for peroxide value are FTIR, DSC and titration methods. However, these methods are complicated and time consuming.

Methods

A multi enzyme based amperometric biosensor was developed and the various process parameter has been optimized. The characterization study of immobilized working electrode was done using Scanning Electron Microscope (SEM) and cyclic voltametry. An empirical relationship was developed between different diglyceride content with the output current. Developed biosensor was validated using HPLC method.

A capacitance sensor was developed for the detection of peroxide value. Preliminary study was conducted for optimization of voltage and frequency.An empirical relation was developed between the current and peroxide value. The developed sensor was validated using titration method.

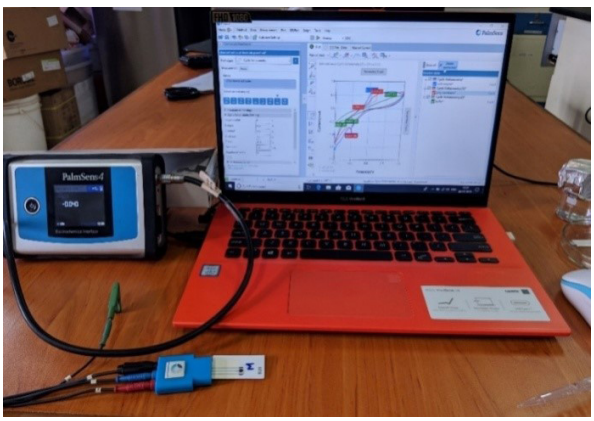


Fig. 1: Setup for the developed biosensor with Screen Printed Electrode

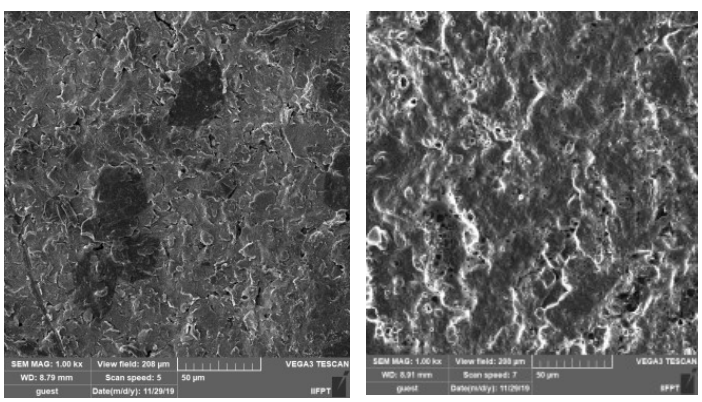


Fig. 2: SEM Analysis a) Bare electrode surface b)Immobilized electrode surface

Fig. 3: Capacitance sensor for detection of Peroxide value

Outcome of the research

The sensor validation study showed results with standard deviation less than 1 and the precision (CV%) value was found to be 0.15 and 0.1 for the 1st day and 7th day respectively. The detection limit was found to be 2 ppm to 1200 ppm with a detection time 20 seconds per sample.

For capacitive type sensor an empirical relationship was developed between the peroxide value and the capacitance with regression coefficient of R2 = 0.97. The validation of the model was done by titration method. The precision of the capacitive type sensor and titration was 8 % and 9.88 % respectively. The detection limit was found to be minimum 0.1 meq/kg of peroxide value with detection time 3-4 min per sample.

Enabling Start-Ups through Value Chain Approach for under Utilized Crops of Arid Region in Tamil Nadu

Research objectives

- Technology appropriation, scale-up and potential intervention for rural entrepreneurship in the project location (Puddukottai district, Tamil Nadu)
- Skill promotion with social engineering for the targeted respondents and promoting start-ups in the agrarian background
- Doubling income of rural youth and promotion of minimum three start-ups in food processing

Background of the research

The study location, Pudukkottai is one of the industrial and economically backward districts in Tamil Nadu. Majority of 85.08 percent farmers are marginal holding as low as 0.59 ha. The district admeasures an area of 4663.29 km with a coastal length of 42 km. The abundant under-utilized crop resources such as; Jackfruit, Cashew apple and Coconut grown in rain-fed and waste lands in this district are grossly under-utilized. The project aims to identify the prospective respondents among the marginalized population strata, promoting them the skills and abilities to venture into food processing. Converting the native resources into high valued products suitable for domestic and international markets through appropriate technological interventions. The respondents of this project are farm women and youth from the selected villages of Pudukkottai district. As a result of intervention.

Methods

Survey technique was adopted for data collection from the respondents of the project on their socio-economic profile, skill gaps, key performance indicators and factors influencing the respondents. The respondents were categorized based on coverage of semi-arid zone crops jackfruit, coconut and cashew. An interview schedule was pre-tested and subjected for the survey. For skill promotion, training modules were developed for the identified arid zone crops.

Outcome of the research

The value added products from under-utilized crops of arid zone were identified and standardized for scale-up and promotion for food industry start-up in the selected locations of the project location. The products such as; fruit based yogurt, concentrated and dried fruit pulp, nutritious fruit bar, candies, leather & mouse, extruded products from mixed fruit pulp, Jack fruit multi-purpose flour, Jack fruit based cookies & pasta, value added palm products such as; Jaggery, syrup, candy and vinegar.

Five awareness cum training programmes were conducted at five selected villages in Pudukkottai district of Tamil Nadu covered under the project. A total of 156 respondents benefitted out of the programme. The trainings cover the prospects and benefits of value addition of the selected arid zone crops jack fruit, palm and cashew. The details are as follow:

S.No.	Dates of Training	Villages covered in Pudukkottai District	No. of Beneficiaries
1	02/12/2019	Vinayaganpatti	28
2	03/12/2019	Paramanpatti	36
3	06/12/2019	Mankuttipatti	32
4	16/12/2019	Puthukkutiyiruppu	25
5	17/12/2019	Sathampatti	35

Development of Non-dairy Synbiotic Food to Ensure Food Safety and Combat Hidden Huger Deficiency

Research objectives

- To screen efficient probiotic isolates of genera Lactobacillus, Streptococcus, and Leuconostoc from indigenous sources and develop probiotic consortium
- Development and validation of synbiotic product using RTR technology using non-dairy based substrates.
- Determination of the effectiveness and efficacy of probiotic intervention in ensuring food safety.

Background of the research

Probiotic food formulations have a great economic value and it has been accepted that these contribute in improving human health. During the last 20 years much of the research on LAB focused on dairy products. Investigations now include different LAB involved in wide variety of fermentation process. This project aims in the designing of functional foods, comprising of a combination of probiotic consortium and prebiotics.

Methods

Isolation, characterization and *in vitro* studies of probiotic consortium. Study of quality characteristics and shelf-life of the synbiotic food.

Outcome of the research

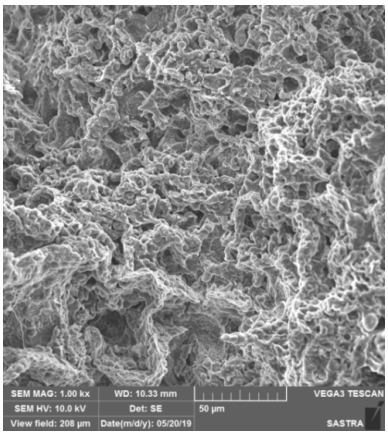
Significant works Carried out from April 2019 to March 2020

- Isolated and characterized three probiotic bacterial and one yeast isolate from coconut sap and probiotic consortium formed. The isolated probiotic strains *Lactobacillus casei* RV-M191, *Lactobacillus paracasei* RV-M192, *Lactobacillus plantarum* RV-M194 and *Pichia manshurica* RV-M193 and its nucleotide sequencing has been submitted to NCBI genbank and accession numbers obtained (https://www.ncbi.nlm.nih.gov/nucleotide/).
- Developed probiotic drink with matured coconut water (MCW). Pre-treatments with flash pasteurization (FP) and radio-frequency (RF) of MCW shows greater effect on reduction of enzyme activity and microbial activity.
- In-vitro tests for the developed drink was performed to study the probiotic effect. Good antibacterial activity observed against *S.aureus* and *E.coli*.
- The probiotic drink found have greater functional properties when analysed for secondary metabolites. Compounds such as L-cysteine, cycloserine, succinic acid, tabun, nicotinic acid, decanoic acid, periciazine, propionic acid, styramate, captopril, estrone, metopon, glycine, ethoxyquin, prolintane, acetic acid, L-tyrosine and serine has been reported during LC/MS screening.

Fruit flavoured PMCW

Fruit flavoured Probiotic ice-lollies

Freeze dried probiotic grains



SEM analysis of Freeze dried probiotic grains

- The probiotic drink is found to be rich in essential amino acids among which valine, lysine and methionine was observed in higher concentration. Apart from this other essential and non-essential amino acids such as L-aspartic acid, L-glutamic acid, L-histidine, glycine, threonine, arginine, alanine and phenylalanine.
- Storage study at 4°C for 28 days proves that drink was stable with very small changes in physicochemical, sensory properties and microbial load till 28 days.
- Probiotic ice-lollies with added natural flavours and natural colours were also developed. Also the obtained probiotic grains after development of drink has been freeze dried and made suitable for further use in food.

Smart Warehouses with Application of Frontier EM & Electronics based Technology (S.A.F.E^2.T.Y.)

Research objectives

- To develop a ware house management (WMS) system for the paddy storage

Background of the research

In ware houses, the biotic and abiotic factors determine the quality of the grain stored. Only through proper control measures of the abiotic environment, it is possible to extend th shelf life ofthe food grains. Insects, for instance, grow and multiply fast in dry and warm grains. The physical environment includes the temperature and the moisture content of the stored grain, and the inter-granular gaseous environment. Monitoring and controlling of physical, chemical, physiological, biological features can minimize the losses during storage in the ware houses. Electronics and electromagnetic engineering are potential tools for monitoring and controlling the above variables during storage of grains in warehouses.

Methods

IIFPT has developed Technologies and gadgets required for monitoring the abiotic environments in the storage ware-house and management tools for safe management of Paddy in collaboration with Food Corporation India, SAMEER, Mumbai & C-DAC, Kolkatta.

Online Moisture Content Measurement system and RF based Moisture controlling and thermal disinfestation system has been developed in collaboration with SAMEER, Mumbai.

E-Vision System for Quality characterization of rice, sensors for monitoring of temperature & RH in the warehouses, phosphine concentration sensors for fumigation and warehouse management system has been developed in collaboration with C-DAC, Kolkatta. Food Corporation of India will adopt technologies developed under this project.

Outcome of the research

- Microwave based portable moisture meter developed under this project is having Accuracy of ±0.50 M.C and repeatability of ±0.80. Online moisture meter developed under this project is having Accuracy of ±0.75 M.C and repeatability of ±0.30.
- ANNADARPAN is the E-Vision system for quality characterization of rice. The separate software has been developed for RAW and parboiled rice. It is having accuracy of ± 0.004 and repeatability of ±0.003
- RF disinfestation system may have the potential to attain 100% mortality of *T. castaneum* where grain temperature is attained in the range of 60 - 63°C @ 500 W power in 3 minutes of exposure time.
- FUMON is the phosphine monitoring sensor during fumigation of stacks in warehouses. It is the portable & user friendly system with a sensing range of 0 - 3000 ppm

Online Moisture Meter & Demonstration

- RFID based warehouse management system has been developed for continuous monitoring of temperature and RH in the warehouse along with maintaining database for individual gunny bags stored in the warehouse.

Conclusions

- The technologies developed under this project has been validated by IIFPT and erected in Food Corporation of India Godown Raipur, Chhattisgarh for adoption.
- One-day workshop has been conducted at Raipur site for the creating awareness and demonstration of technologies to the end user. FCI and CWC officials across the country participated in this workshop.

Research objectives

- To develop process technology for innovative value added products from selected millets
- To study the quality parameters (morphological, physicochemical, sensory properties) shelf stability and economic feasibility of developed millet products

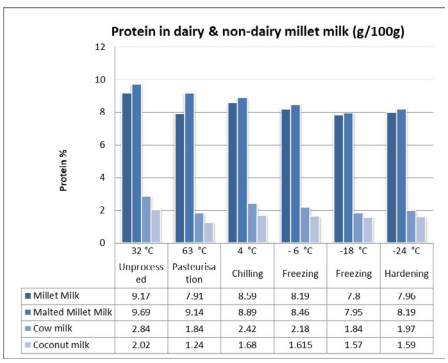
Background of the research

Millets in India are cultivated in 29 million hectares annually (Prakasha, Murthy, Prathima, & Meti, 2018). It is also one of the underutilized crops and needs to be diversified through value addition. Millet milk, millet milk powder, edible pouch/ film is one such product. Inspite of all plant milk variety of choices being available, when it comes to applicability in replacing the dairy milk in its various forms, which involves treatments at low and high temperatures, many of these sources fail. Tester and Karkalas (1996) studied the cereal based milks, especially oats to find that they contained starch enough to cause gelatinization on thermal treatments. This changes the physical properties of milks significantly which further restricts its use in various non-dairy foods. In the case of Soy milk, although the market has already been established and was among the first to be introduced to the market of non-dairy milks, soy allergy and the off flavor it possesses, poses a major problem to its further scopes as a dairy replacement (Fukui, Tachibana, & Wanezaki, 2002). So any non-dairy milk with an acceptable sensory quality and protein content can compete with soy milk in the market for dairy alternatives, because they do not pose the risks of allergy or off flavor. The same goes for the milks derived from the nuts as nut allergy is highly prevalent (Sicherer, Burks, & Sampson, 1998). When these factors are considered, millets stand to be good source for dairy alternatives. Being high in protein, lesser starch content and of mild flavor, it makes up for the lacuna found in other sources. Millets are widely cultivated, and are known to thrive well with less maintenance, making it an ideal crop to be used as a dairy replacement through value addition.

Millet milk is mainly preferred due to its nutritional superiority over other sources of plant milks. It is high in protein, but also low in calories (Raajeswari & Nithya, 2016). This makes it an ideal replacement for dairy especially in the current scenario where high nutrition and low calorie foods are preferred. But studies need to be done on the applicability of the millet milk to different types of food wherein it is subjected to various kinds of processing at different temperatures. Most of the flavor compounds are fat soluble and fat–protein interactions create a platform for the flavor reactions to take place (Lopez, 2005). Moreover, flavor and texture are highly influenced by fat content of the food (Drewnowski, 1997). Protein–fat interactions play a major role in emulsifying activity hence making them the two major components that influence the processing of milk and milk products (Jost, 1993). Hence, it is necessary to study the changes in nutritional content during processing. This paper deals with the effect of processing on the nutritional quality and its comparison with other plant milk and dairy milk.

Methods

The millets were procured from the local markets of Thanjavur. Cow's milk was used as a dairy source to compare with the millet milk (non-dairy milk). Coconut milk was used as a non-dairy milk source to compare with the millet milk under the same treatment conditions. Malted millet milk was used to study the effect of malting on the quality of the millet milk. The millet milk and coconut milk were extracted using conventional methods as described as follows. Millet was soaked for 8–12 hr and ground in a colloidal ball mill and filtered using a filter press to get a clarified liquid which is millet milk. One batch of malted millet milk was also included in the study wherein the germinated millets (kept for germination for 24 hr at 25–30C) were used in the place of raw millets. Coconut milk was prepared by shredding the coconut kernel using a coconut shredder and grinding it in the colloidal ball mill followed by filtering using a filter press to get the coconut milk. Raw milk was procured from a local dairy farm at Thanjavur. All the milk samples were subjected to various low and high temperature treatments described as follows. Pasteurization was done in the steam jacketed kettle at 63C for 30 min. Chilling and freezing were carried out in a refrigerator at 4C for 4 hr and −5C to −6C for 4 hr, respectively. Cooling and hardening were done using individual deep freezers set at −18C for 4 hr and −28C for 8 hr, respectively. The samples after each treatment were analyzed for nutritional content (carbohydrates, protein, fat, crude fiber, ash, moisture content, and energy) according to AOAC methods. pH was measured using a calibrated pH meter and



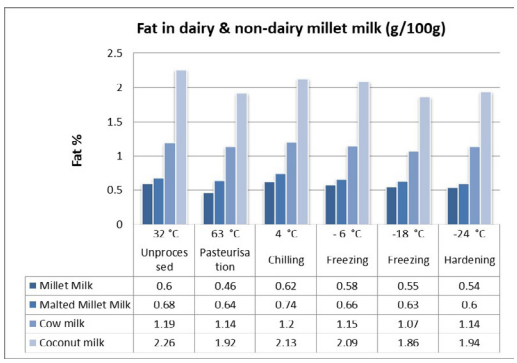


Fig. 1: Effect of processing on the nutrient composition of the millet milk

TSS was measured using digital refractometer. Viscosity was measured using Brookefield viscometer with 64S spindle at 100 rpm

Outcome of the research

The effect of different processing like pasteurization, chilling, freezing, cooling and hardening on the protein and fat content of millet milk in comparison to that of dairy milk and plant milk such as coconut milk was studied. When compared to dairy milk, the millet milk showed higher energy (383 kcal) and comparable level of carbohydrates (78%). While the millet milk has higher crude fiber (0.9%) than dairy milk (0.73), it has lesser fiber content than coconut milk (2.26%). Owing to its mineral content, millet milk also exhibited high ash content (0.35%). The low temperature processes resulted in a very slight reduction of protein (8.5–7.8%) and fat content (0.74–0.6%) when compared to that of unprocessed millet milk (9.1%) yet it still stood much higher than that of dairy milk (2.4–1.8% protein and 1.2–1.1% fat) even after being processed. There was also an increase in TSS and a decrease in viscosity with lower temperatures. Malted milk showed an increase in protein and fiber content whereas an increase in ash content. The malting process proves beneficial since it results in a product with increased protein and decreased fat levels.

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Food Processing Business Incubaton Center

IIFPT Food Processing Business Incubation Centre (FPBIC) offers long term and short-term skill development training programs on various aspects of food processing for farmers, self-help groups, industrialist, students, researchers and new entrepreneurs during the financial year 2019 – 2020.

Millet Ice-cream technology was transferred to a start-up company M/s. AP Fresh, Trichy. Sixty-four beginner trainings, twenty executive trainings, three in-plant trainings, eight sponsored trainings and one women empowerment training programs were conducted on various food processing technologies and value addition of cereals, millets, pulses, fruits and vegetables. Also, four external students have done their project work during the period of 2019 to 2020. A total of 1451 beneficiaries took part in the skill development training programmes including technical guidelines and incubation services. For the benefit of farmers and entrepreneurs, twenty on-farm trainings using IIFPT's mobile food processing unit also conducted at various places across the country. Around eighty-nine thousand four hundred and fifty participants were benefitted.

Trainees with our Director

Beginners Training (1 Day)

S.No	Date	Title of the Technology	Beneficiaries
1	02.04.2019	Value Addition of Mango	01
2	04.04.2019	Value Addition of Tomato and Onion	03
3	12.04.2019	Preparation of Muffins and Fancy Cake	02
4	16.04.2019	Fruit Beverages	02
5	23.04.2019	Preparation of Mixed Masala	11
6	30.04.2019	Value Addition of Millets	08
7	02.05.2019	Value Addition of Mushroom and Moringa	12
8	07.05.2019	Preparation of Bakery Products	03
9	09.05.2019	Value Addition of Mango	04
10	21.05.2019	Preparation of Cookies	01
11	28.05.2019	Value Addition of Millets	05
12	30.05.2019	Pickling Techniques	02
13	04.06.2019	Value Addition of Amla	03
14	18.06.2019	Dehydration of Fruits and Vegetables	07
15	20.06.2019	Value Addition of Millets	06
16	02.07.2019	Value Addition of Seasonal Fruits	01
17	04.07.2019	Value Addition of Moringa	16
18	16.07.2019	Preparation of Homemade Chocolates	03
19	30.07.2019	Preparation of Ice-cream	04
20	01.08.2019	Value Addition of Amla	03
21	06.08.2019	Value Addition of Tomato and Onion	02
22	08.08.2019	Value Addition of Millets	05
23	13.08.2019	Value Addition of Coconut	08

S.No	Date	Title of the Technology	Beneficiaries
24	20.08.2019	Value Addition of Banana	08
25	22.08.2019	Pickling Techniques	03
26	03.09.2019	Value Addition of Papaya	01
27	20.09.2019	Value Addition of Millets	05
28	24.09.2019	Preparation of Homemade Chocolates	05
29	26.09.2019	Preparation of Bakery Products	01
30	03.10.2019	Value Addition of Moringa	08
31	10.10.2019	Preparation of Bakery Products	01
32	15.10.2019	Value Addition of Fruits and Vegetables	03
33	17.10.2019	Dehydration of Fruits and Vegetables	09
34	29.10.2019	Preparation of Ice-cream	06
35	31.10.2019	Value Addition of Tomato and Onion	05
36	05.11.2019	Extraction of Oil from Nuts and Oilseeds	07
37	07.11.2019	Processing of Fruit Beverages	13
38	14.11.2019	Value Addition of Millets	16
39	19.11.2019	Pickling Techniques	03
40	22.11.2019	Value Addition of Coconut	07
41	27.11.2019	Value Addition of Fruits and Vegetables	13
42	03.12.2019	Preparation of Mixed Masala	02
43	05.12.2019	Value Addition of Tomato and Onion	03
44	12.12.2019	Dehydration of Fruits and Vegetables	11
45	17.12.2019	Value Addition of Amla	03
46	24.12.2019	Value Addition of Millets	07
47	26.12.2019	Value Addition of Mushroom	04
48	02.01.2020	Value Addition of Moringa	04
49	07.01.2020	Value Addition of Millets	02
50	09.01.2020	Value Addition of Amla	03
51	20.01.2020	Special Training on Value Addition of Fruits and Vegetables	07
52	21.01.2020	Preparation of Bakery Products	08
53	23.01.2020	Pickling Techniques	05
54	04.02.2020	Value Addition of Green Chillies	02
55	06.02.2020	Preparation of Ice-Cream	14
56	07.02.2020	Special Training on Functional Foods	03
57	11.02.2020	Value Addition of Coconut	08
58	13.02.2020	Value Addition of Papaya	04

S.No	Date	Title of the Technology	Beneficiaries
59	25.02.2020	Value Addition of Carrot and Beans	04
60	27.02.2020	Value Addition of Tomato	01
61	03.03.2020	Preparation of Cakes	01
62	05.03.2020	Value Addition of Leafy Vegetables	03
63	11.03.2020	Value Addition of Pineapple	01
64	17.03.2020	Value Addition of Mushroom	05
		Total	**331**

Executive Trainings (3 Days)

S.No.	Date	Title of the Technology	Beneficiaries
1	09.04.2019 - 11.04.2019	Value Addition of Cereals, Pulses and Millets	01
2	07.05.2019 - 09.05.2019	Millet Processing and Value Addition	01
3	14.05.2019 - 16.05.2019	Processing of RTE and RTC Foods	08
4	18.06.2019 - 20.06.2019	Value Addition of Mango	02
5	16.07.2019 - 18.07.2019	Bakery Products	06
6	01.10.2019 - 03.10.2019	Training on Food Processing	01
7	22.10.2019 - 24.10.2019	Value Addition of Fruits and Vegetables	09
8	19.11.2019 - 21.11.2019	Bakery Products	05
9	10.12.2019 - 12.12.2019	Preparation of RTE and RTC foods	04
10	28.01.2020 - 30.01.2020	Preparation of Mixed Masala and Pastes	10
11	10.03.2020 - 12.03.2020	Carbonated & Non-Carbonated Fruit Beverage Processing	10
		Total	**57**

Executive Trainings (5 Days)

S.No.	Date	Title of the Technology	Beneficiaries
1	22.04.2019-26.04.2019	Bakery Products	02
2	22.07.2019-26.07.2019	Processing of Masala Powders, Pastes and Pickles	05
3	19.08.2019-23.08.2019	Bakery Products	03
4	23.09.2019-27.09.2019	Value Addition of Fruits and Vegetables	01
5	14.10.2019-18.10.2019	Value Addition of Cereals, Pulses and Millets	07
6	25.11.2019-29.11.2019	Processing of Masala Powders, Pastes & Pickles	08
7	16.12.2019-20.12.2019	Bakery Products	05
8	20.01.2020-24.01.2020	Value Addition of Fruits and Vegetables	03
9	24.02.2020-28.02.2020	Post-Harvest Management and Processing of Fruits and Vegetables	04
		Total	**38**

In-plant Trainings on Food Processing (1 Month)

Major target of the programme is giving hands-on-training to students and researchers from various institutes across the country on various food processing principle and applications using the pilot plants available at FPBIC.

S.No.	Date	Title of the Technology	Beneficiaries
1	01.05.2019-31.05.2019	Food Processing	03
2	31.05.2019	Food Safety and Quality Testing	11
3	05.07.2019-05.08.2019	Internship on Food Processing and Instrumentation	03
		Total	**17**

Sponsored Trainings

S.No.	Date	Title of the Training	Collaborators / Institute	Beneficiaries
1	23.09.2019 – 28.09.2019	Training of Assessor Program (TOA)-Domain and Platform Skill Training	FICSI, NSDC	19
2	06.12.2019	Value Addition of Millets	Department of Agricultural Marketing & Agri. Business, Thirupur District	38
3	08.01.2020 – 09.01.2020	Value Addition of Millets	Department of Agricultural Marketing & Agri. Business, Thiruvenkadam, Thenkasi District	40
4	06.02.2020	Training on Mobile Processing Unit	FPO, Department of Agricultural Marketing & Agri. Business, Thondamuthur, Coimbatore District	07
5	06.02.2020	Value Addition of Coconut Products and Icecream	Department of Agricultural Marketing & Agri. Business, Nagercoil District	40
6	11.02.2020	Value Addition of Food Crops	Department of Agricultural Marketing & Agri. Business, Nagapattinam District	63
7	14.02.2020	Special Training on Post-Harvest Management, Value Addition and Supply Chain Management	Department of Agricultural Marketing & Agri. Business, Dindigul District	40
8	03.03.2020 – 05.03.2020	Ice-Cream Processing	FPO Srikakulam, Andhra Pradesh	25
			Total	**272**

Members of Farmers Producers Organisation, Srikakulam, Andhra Pradesh with our Director

Special Training (One day)

S.No.	Date	Title of the Training	Beneficiaries
1	08.03.2020	Empowerment of Rural Women by Nurturing Food Entrepreneurship Skills on International Women's Day	600
		Total	**600**

One-day Special Training entitled "Empowerment of Rural Women by Nurturing Food Entrepreneurship Skills" was conducted on 8th March, 2020. More than 600 beneficiaries such as women entrepreneurs, start-ups, SHG's, unemployed youth and students from various regions of Thanjavur, Kumbakonam, Pattukottai, Trichy and Madurai took part in this training programme.

External Students Project (3 Months)

S.No.	Title of the Project	Details of the Students	Beneficiaries
1	Development of Plant Milk based Health Drink	Ms. Anjana Chandran Mahatma Gandhi University, Kottayam, Kerala	01
2	Development of Bakery Products from Pomegranate Seed	Ms. Vidya Jeyan College of Indigenous Food Technology, Konni, Kerala	01
3	Development of Millet based Nutripak	Ms. Swetha Jeppiar Engineering College, Chennai	01
4	Development of Value Added Products from *Solanum betaceum* (Tamarillo) Fruit	Ms. Sharmija Jeyachandran GCT, Coimbatore	01
		Total	**04**

On-Farm Skill Development Training using Mobile Food Processing Unit (1 Day)

IIFPT has designed an On-Farm Mobile Processing Unit for those who want the processing of their produce on the farm itself immediately after harvest. This unit has demonstrated and provided services to various clients in all over India. This kind of processing reduces the transportation charge of the fresh produce to a great extent, thereby benefitting the producers with high quality finished product. Also helps in converting the raw material to intermediate or final product at the time of surplus production to avoid post-harvest losses.

Nearly twenty on-farm skill development training programmes using Mobile Food Processing Unit were conducted with more than 80000 participants from various regions of our country like farmers, self-help groups, start-ups and entrepreneurs during the year 2019-2020. The month-wise programme list is given below:

S.No.	Month	No. of Programmes	No. of Beneficiaries
1	May, 2019	02	56
2	June, 2019	01	800
3	July, 2019	01	100
4	August, 2019	01	100
5	September, 2019	02	1500
6	October, 2019	02	1106
7	January, 2020	01	20000
8	February, 2020	07	60000
9	March, 2020	02	5750
		Total	**89412**

MPU Hands-On Training Conducted for Farmers and Government Officials from Various Clusters in Tamil Nadu

S.No.	Date	Name of the FPO / Government Officials	Beneficiaries
1	21.05.2019	Nellikani CF-FPCL, Palacode, Dharmapuri District Subramaniya Siva CF-FPCL, Papparapatti, Dharmapuri District Avai CF-FPCL, Harur, Dharmapuri District Kelamangalam Vegetable CF-FPCL, Krishnagiri District Resahe Farmer Producer Company, Hosur, Krishnagiri District Agri Marketing and Agri Business, Coimbatore District	26
2	25.09.2019	Assistant Directors from Pethanaickonpalayam, Panamarathupatty block and Deputy Horticulture Officer from Mecheri, Valapady, Salem District	05
3	06.02.2020	Vellangri Uzhavan Producer Company Ltd., Pooluvapatti - 641101, Coimbatore District	07
		Total	**38**

Technical Guidelines / Consultancy Programmes (3 Months)

Technical guidelines cum training programme for a period of three months were conducted on improvement and value addition of their existing and new production technologies under commercialization. Trainings were conducted for industries mentioned below:

S.No.	Title of the Technology/Product	Client Name & Place	Beneficiaries
1	ABC Health Drinks	Mr. Loga Divakar, Chennai	03
2	Tomato Sauce Manufacturing	Mr. V. Santhana Bharathi, Tirupur	03
3	Rice Based Products	Mrs. M. Thesiga, Pudukkottai	03
4	Shelf Life Extension of Gulab Jamun	Mr. R. Jason, Palayamkottai	03
5	Instant Soup Mix Powder	Mr. M.S. Mohan, Chennai	03
6	Shelf Life Extension of Coconut Balls	Mr. K.P. Mahesh, Onchiyam, Kerala	03
7	Preservation of Rava Laddu	Mr. S. Govindaraj, Dharmapuri	03
8	New Product Development from Fig	Mr. K. C. Ranjith, Namakkal	03
9	Ready to Eat Products	Mr. M. Vignesh Raj, Tirupur	03
10	Rusk Making	Raj Foods, Thiruvarur	03
11	Herbal Tea	Dr. Kalaimagal, Thanjavur	03
12	Development of Fried Snacks	Mrs. Lamitha V M, Thrissur	03
		Total	**36**

Incubation Services

This service offers the budding entrepreneurs a platform to use equipment for their product trial on a rental basis. This service has vastly helped the farmers especially, who had surplus raw materials to be processed and want to try out the machineries that would suit them the best for it. Capital Investment for our clients is not a barrier as our Incubation Service scheme caters their need. Thirty-two incubation services were provided for processing various food products. The following list of products were prepared by the entrepreneurs and farmers using incubation services during the period of 2019 to 2020.

S.No.	Date	Name of the Product	Equipment used
1	11.04.2019	Millet Pasta	Pasta Machine & Blancher
2	12.04.2019	Traditional Rice Macaroni	Pasta Machine & Blancher
3	15.04.2019	Finger Millet Spaghetti	Pasta Machine, Dryer & Blancher
4	20.04.2019	Bajra Pasta	Pasta Machine, Dryer & Blancher
5	30.04.2019	Traditional Rice, Millet Pasta	Pasta Machine & Blancher
6	22.05.2019	Millet Fusilli	Pasta Machine, Dryer & Blancher
7	23.05.2019	Multigrain Rigatoni	Blancher, Dryer & Pasta Machine
8	17.06.2019	Moringa Leaves Powder	Dryer & Blancher
9	08.07.2019	Spaghetti	Pasta Making Machine, Steamer & Dryer
10	18.07.2019	Flakes	Flaker & Dryer
11	09.09.2019	Fryms	Dryer
12	09.09.2019	Desiccated Coconut	Dryer
13	21.09.2019	Vermicelli	Pasta Making Machine, Dryer & Blancher
14	03.10.2019	Functional Cookies	Oven & Planetary Mixer
15	17.10.2019	Amla Candy	Dryer
16	18.10.2019	Osmo-Dried and Dried Fruits	Dryer
17	21.11.2019	Pasta and Flakes	Pasta Machine
18	28.11.2019	Millet Flakes	Flaking Machine & Dryer
19	27.11.2019	Pasta	Pasta Machine, Steamer & Dryer
20	29.11.2019	Whole Wheat Pasta	Pasta Machine, Steamer & Dryer
21	29.11.2019	Pulses and Cereals	Solar Dryer & RF Dryer
22	02.12.2019	Millet Pasta	Pasta Machine, Steamer, Dryer & Mixer
23	03.12.2019	Cereals	Solar Dryer
24	05.12.2019	Rotini	Solar Dryer
25	05.12.2019	Rice Pasta	Pasta Machine, Steamer, Dryer & Mixer
26	16.12.2019	Millet Cookies	Pasta Machine & Steamer
27	20.12.2019	Pasta	Pasta Machine, Steamer, Dryer & Mixer
28	22.01.2020	Multigrain Cookies	Planetary Mixer & Oven

S.No.	Date	Name of the Product	Equipment used
29	31.01.2020	Millet Pasta	Pasta Machine, Steamer & Dryer
30	18.02.2020	Spagheti	Pasta Machine & Blancher
31	28.02.2020	Millet Pasta	Pasta Machine & Blancher
32	12.03.2020	Ravioli	Pasta Machine & Dryer

Successful Entrepreneurs

The following entrepreneurs started new food processing industries in various sectors during the period of 2019 to 2020:

S.No.	Name of the Start-up	Name of the Industry	Brand Name	Product Name
1	Mrs. Kokila	K3 Kwality Foods, Orathanadu	K3 Kwality Foods	Bakery Products (Millet Cookies)
2	Mrs. N. N. Keerthana	Herigate Agro Company #7, Periyar Street, Nallagoundenpalayam, Gobichettipalayam (P) Pin: 638 452 M: 7373505005 / 9442735005, E: herigateagrocompany@gmail.com	Flavours Avenue	Noni Juice, Triphala Juice, Moringa Juice, Palmyra Palm Juice, Betel Leaf Juice, Amla Juic, Beetroot Concentrate, Butterfly Pea Concentrate, Carrot Concentrate, Hibiscus Concentrate, Lemon-Ginger-Mint Concentrate
3	Mr. Gajendran Elavarasi	Sree Abirami Foods No. 6, Pushpa Vaniga Valagam, Avaiyambalpuram, Mayiladuthurai M: 9715354442/8903277442 E: sriabiramibakeryandsnacks@gmail.com	Bakery and Snack Food Products	Bread, Pie, Puff, Pastries, Savories, Tart, Cakes, Cookie etc.

Visitors

About 3788 visitors such as farmers, new entrepreneurs, students, researchers from various states have visited IIFPT Food Processing Business Incubation Centre during the period of April 2019 to March 2020 to explore new avenues in food processing and enrich their knowledge through innovative technologies.

List of Visitors from Various Organization / Institutes

S.No.	Organization / Institute	No of Visitors
1	Agricultural College and Rural Development, Kovilpatti	29
2	Junior Engineer, Trichy	21
3	RVS Agri College, Thanjavur	133
4	Livelihood CRP, CARE INDIA NGO, Cuddalore	57
5	Agri Engineer Department, Thanjavur	22
6	Agri College, Trichy	20
7	Krishnammal College, Coimbatore	48
8	Assistant Director of Agri Office, Mayiladuthurai	50
9	TNAU, Coimbatore	50
10	Kings College of Engineering, Thanjavur	168

S.No.	Organization / Institute	No of Visitors
11	Mailam Engineering College, Villupuram	80
12	Dr. Umayal Ramanathan College, Karaikudi	95
13	AP & AS Kalavai Students	23
14	PHM and Value Addition Training	50
15	BTM Mangalore Agri	30
16	BTM-ATMA Kolli Hills	70
17	Kumaraguru Institute of Agriculture	100
18	ATMA Farmers	16
19	Srinivasa College	400
20	SBI	24
21	Agri University	31
22	Agri Department Vellore Block	75
23	Chettinad College of Engg & Technology	56
24	SASTRA, Thanjavur	55
25	MZCET, Pudukkottai	34
26	Bankers	15
27	Agri Marketing	36
28	Sathaiah College	114
29	Agri Office	72
30	Don Bosce College, Vellore	109
31	KVK Vamban	35
32	National College, Trichy	48
33	Agri Officers, Kudumalai	30
34	Muthayammal College, Rasipuram	46
35	SASTRA, Thanjavur	52
36	Block Technology Manager	36
37	Kalasalingam University, Krishnankovil	61
38	ICAR-PKKVK, Puducherry	19
39	Deputy Director of Marketing Madurai, Anna Nagar	40
40	Block Technology Manager, Cuddalore	22
41	DD AB Agricultural Officer, Madurai	50
42	Pattukkottai Polytechnic College, Pattukkottai	59
43	KRISAT, Usilampatti	45
44	Study Tour Students	108
	Total	**2734**

Summary

S.No.	Category	No. of Trainings	No. of Beneficiaries
1	Beginners Training (1 Day)	64	331
2	Executive Training (3 Days)	11	57
3	Executive Training (5 Days)	09	38
4	In-plant Training (1 Month)	03	17
5	Sponsored and Special Training	09	872
6	External Students Project (3 Months)	04	04
7	Technical Guidelines Service (3-6 Months)	12	36
8	Incubation Service	32	96
9	On-Farm Mobile Processing Unit Training	22	89450
	Total	**166**	**90901**

Food Testing Laboratory

Food Testing Laboratory (FTL) of IIFPT is a state-of-art facility equipped with hi-tech precision equipments and is accredited by National Accreditation Board for Testing and Calibration Laboratories (NABL) under ISO/IEC 17025:2017. In addition, this laboratory holds an FSSAI Referral laboratory status and has extended its services over two decades. FTL proudly acclaims the potential of its experienced, well qualified scientific and technical man power. We provide quality services to the academic/ research institutes, food industries, stake holders, entrepreneurs etc.

As the food testing has taken a giant leap in India towards ensuring safety of food consumed, the role of Food testing laboratories is indispensible. The Department of Food Safety and Quality testing has opened a new wing – The molecular testing facility. This will enable the analysis to be carried out at the single cell level and at the DNA level. The microbial identification system enables to identify microbes associated with food in simple steps. To enumerate the bacterial and fungal organisms (loads) from the food samples,

- To identify the bacterial and fungal strains from the food samples based on biochemical characteristics/ nature of the respective organisms
- To identify the presence of pathogens from the food samples by VIDAS (under the principle of Ag-Ab reaction)

The genetic analyzer is useful in sequencing the genetic material (DNA) of microbial and food samples. This equipment will enable us to detect if the food is composed of traditional varieties or genetically modified cultivars. Along this line the laboratory has installed a state-of-art gas chromatography with head space, where by food flavours can be easily identified.

Fibres in food improves the quality of food to be branded as healthy and balanced, in the scope assessment of fibre in food products is an essential part of the nutritional facts. To cut back on time spent on the bench to determine the quantity of fibres, the laboratory has installed a total dietary fibre analyser and a crude fibre analyzer. To determine that the nature of compounds does not change the functionality of food a non-invasive tool namely FTNIR is installed and samples are being analysed at a regular basis.

As water being used in preparation and cleaning purpose is an inseparable component of food to improve the quality and taste. To test and confirm that only clean hygienic water is used in food preparations the lab two equipment water analyzer and water activity to serve the purpose. Alongside installing new equipments the lab also out-phases old equipment and replaces with new one. The spectrophometer with fluorescence and a cooling centrifuge are new additions in the fleet.

Salient Features

The laboratory has tested a total of 841 samples last year which includes about 4205 parameters. The services of the laboratory span across samples from the public, students and entrepreneurs of the food industry. Additionally, the lab also catered to students' research samples from IIFPT and NIFTEM.

FSSAI

As a FSSAI referral lab, the unit has addressed the analytical needs for samples from the FSSAI officers in the state of Tamil Nadu as well as others posted in ports of entry. In the last year the laboratory has mitigated five samples from FSSAI to resolve the dispute.

A. Testing Services Revenue

Month	Commercial Samples	Internal Samples	Total Samples	Commercial Sample Revenue (Rs.)	Internal Sample Revenue (Rs.)	70% Concession (Rs.)	Testing Revenue (Rs.)
April	25	24	49	372092	11187	37290	420569
May	41	42	83	569158	109229	364097	1042484
June	18	11	29	142791	27885	92950	263626
July	33	33	66	477092	46980	156600	680672
August	32	45	77	208460	51651	172170	432281
September	18	29	47	118853	12507	41690	173050
October	52	28	80	227607	24335	81117	333059
November	42	66	108	235460	76802	256007	568269
December	18	46	64	138757	43181	143937	325875
January	25	24	49	146912	10560	35200	192672
February	51	37	110	462933	45689	152297	660919
March	38	31	69	401242	43248	144160	588650
Total	**393**	**416**	**831**	**3501357**	**503254**	**1677513**	**5682124**

B. Training & Internship Services Revenue

Month	Training (Rs.)	Internship (Rs.)	Total (Rs.)
April	Nil	Nil	Nil
May	23880	Nil	23880
June	9440	153400	162840
July	9440	11800	21240
August	5900	Nil	5900
September	Nil	Nil	Nil
October	37760	Nil	37760
November	236000	Nil	236000
December	167560	Nil	167560
January	Nil	Nil	Nil
February	15340	Nil	15340
March	Nil	Nil	Nil
Total	**505320**	**165200**	**670520**

C. Consolidated Revenue

Month	Testing (Rs.)	Training (Rs)	Internship (Rs.)	Total (Rs.)
April	420569	Nil	Nil	420569
May	1042484	23880	Nil	1066364
June	263626	9440	153400	426466
July	680672	9440	11800	701912
August	432281	5900	Nil	438181
September	173050	Nil	Nil	173050
October	333059	37760	Nil	370819
November	568269	236000	Nil	804269
December	325875	167560	Nil	493435
January	192672	Nil	Nil	192672
February	660919	15340	Nil	676259
March	588650	Nil	Nil	588650
Total	**5682124**	**505320**	**165200**	**6352644**

IIFPT

Outreach

Number of expos and outreach activities conducted / participated with details of event, location and dates (2019-20)

S.No.	Event	Place	Dates
1	Dinamani Education Expo	Thanjavur, Tamil Nadu	6-7 April, 2019
2	Destination Uttarakhand	Dehradun	18-20 July, 2019
3	Food & Technology Expo 2019	Pragati Maidan, New Delhi	1-3 August, 2019
4	India International Hospitality Expo 2019	Noida, Uttar Pradesh	7-10 August, 2019
5	Annaporna Anufood India 2019	Mumbai, Maharashtra	29-31 August, 2019
6	Agritex India 2019	Hyderabad, Telangana	5-7 September, 2019
7	Vision Rajasthan 2019	Udaipur, Rajasthan	17-19 September, 2019
8	Times of India, Food and Technology Expo - 2019	Chennai, Tamil Nadu	11-13 October, 2019
9	10th Krishi Fair 2019	Puri Town, Odisha	21-25 October, 2019

S.No.	Event	Place	Dates
10	International Conference & Exposition on Coconut by KSIDC	Kozhikode, Kerala	2-3 November, 2019
11	Exhibition Cum Workshop on Technologies in Food Processing- Developed by CSIR	Constitution Club of India, New Delhi	13 November, 2019
12	14th Krishithon	Nashik, Mumbai	21-25 November, 2019
13	Global Exhibition on Services by Ministry of Commerce & Industries	Bengaluru, Karnataka	26-28 November, 2019
14	Agricultural Science Exhibition for Farmers	Madathukulam, Kankeyam, Tamil Nadu	22 December, 2019
15	Indian Science Congress Expo 2020	Bengaluru, Karnataka	3-7 January, 2020
16	VAIGA 2020	Thrissur, Kerala	4-7 January, 2020
17	Roto Agri Expo 2020	Thanjavur, Thanjavur	10-12 January, 2020
18	IIFPT Stall at Indo-Canadian Workshop	IIFPT, Thanjavur, Tamil Nadu	21-22 January, 2020
19	27th Indian Convention of Food Scientists and Technologists (ICFoST)	Tezpur, Assam	30 January - 1 February, 2020
20	Cattle Research Park Expo	Thalaivasal, Salem, Tamil Nadu	9-11 February, 2020
21	National Organic Food Fest for Women Entrepreneurs	JN Stadium, New Delhi	21-23 February, 2020
22	International Conference on Banana 2020 - Organized by NRCB	Trichy, Tamil Nadu	22-25 February, 2020

Workshop cum Demonstration Organised for Industry on Wheels Programme under Pradhan Mantri Kisan SAMPADA Yojana (PMKSY)

Event	Place	Dates
PMKSY - Industry on Wheels	Thrissur, Kerala New Delhi Bathinda, Punjab Ludhiana, Punjab Bophal, Madhya Pradesh Jalgaon, Maharashtra	4-7 January, 2020 21-23 February, 2020 25 February, 2020 27 February, 2020 2 March, 2020 4 March, 2020

Seminar / Training Courses Organized

Short Course on Food Business Management

A short course on Food Business Management was organised from 16th to 18th May 2019 at Chennai, Tamil Nadu. The course covered trends in food business management & technology, data analytics, quality regulations, policy, IoT, Market and logistics etc. A total of 42 participants include food business operators and budding entrepreneurs attended the course.

In-plant Training on Food Processing Technology and Management @ IIFPT

IIFPT organized in-plant training from 1st June to 30th June 2019 on "Food Processing Technology and Management" at IIFPT. Nineteen students form Agricultural Engineering Colleges in Gujarat and Maharastra attended the program. The course covered both basics and advanced modules in food processing. The course was delivered through lectures, demonstrations, practical and field visits.

Mobile Food Processing Facility

- IIFPT signed MoU with Tamil Nadu State Agri. Marketing for five mobile food processing unit with total budget of Rs.200.00 lakhs.
- IIFPT designed and fabricated the Mobile Food Processing Unit (MPU) for Tamil Nadu State Agri Marketing Agency under NADP scheme. MPU facilitates the farmers to develop value added products from fruits and vegetables to minimize the huge post-harvest losses at the farm site during surplus production time.
- IIFPT handed over the Mobile Food Processing Units to the state horticulture departments of Tamil Nadu by the Honourable Chief Minister of Tamil Nadu Shri. Edappadi K Palaniswami on 26th August 2019.

Honourable Chief Minister of Tamil Nadu Shri. Edappadi K Palaniswami visiting the MFPU of IIFPT

National Seminar on Advances in Bulk Grain Storage & Smart Sensor and IoT Application in Warehouses

A National Seminar on Advances in Bulk Grain Storage & Smart Sensor and IoT Application in Warehouses was organised on 26th July 2019 at IIFPT campus. The seminar was organised as part of the Indo-UK Collaborative Project "Grain Care" funded DBT. The seminar aimed to update the current scientific and technical advancements in grain storage and handling to the participants. To make understand the rationale of sensors application in grain storage to the participants. To formulate strategy for deployment of sensors and data management and acquainted skill for bulk handling of food grains. Over 700 Participants include; Officials in Food & Agricultural Departments, Executives & Technical Managers in Grain Handling Agencies, Millers, Budding Entrepreneurs, Academicians and Students attended the seminar.

Vikatan Student's Talent Search Programme as Knowledge Partner

IIFPT collaborated as knowledge partner with Vikatan Group of Publication and organised a Student's Talent Search Programme at IIFPT on 19th October 2019. The event was organised to recognise the school children talents in diversified areas of demography and other current affairs of the Thanjavur district. Around 1000 school students participated in the event.

IIFPT

Swachh Bharath

Constitution of various committees for the NSS students

In order to develop the interpersonal skills of students, NSS orientation meeting for students was conducted on 30th March 2019. The history and motto of NSS was explained to the students. Addition, molding the students to various capabilities and conditions and improving them through life skills were explained. The students were divided into various committees based on their interest such as documentation committee, photography committee, food committee, general arrangement committee. This will help to the organize various programmes that are conducted as a part of indoor or outdoor public activities.

Formation of various committees within IIFPT NSS volunteers

Cleaning and watering the saplings, trees and flowering plants

Cleaning and watering the tree plantings

IIFPT NSS volunteers cleaned the garden area and watered all the trees (mango, guava, jack fruit and flowering plants) around the campus. Maintaining the plantings during summer is crucial for the sustenance and survival of the plants. Regular watering of plants were done by the volunteers on a regular basis.

Creation of Voter's awareness forum & electoral quiz competition

Voter's awareness forum was formed at IIFPT to establish and extend electoral literacy to the employees and students. As a part of the VAF a quiz programme was conducted at IIFPT to all the staff and students on 12.04.2019. Question on the Indian elections 2019, electoral roll, addition and deletion of names in electoral roll, helpline details, tender and postal voting system, etc., were asked. Also, demonstrations on mock poll, actual polling system and NOTA through a power point presentation

Voter awareness Forum at IIFPT

Voter awareness Quiz competition conducted at IIFPT

IIFPT - NSS students formed a symbol with voter finger in India

was made and video played for the benefit of the participants. Use of EVM and the role of VVPAT during polling was also explained during the forum. All the participants were actively involved in the quiz programme.

As a part of NSS activity as well as voter awareness forum, students formed a symbol indicating voter's finger inside India, to assure that every eligible voters must vote to achieve 100 % voting in India.

Voter Awareness Rally conducted by NSS volunteers at Thanjavur city

In order to assure fair and 100 % voting, NSS students made a successful attempt to spread the message on the importance of voting, right of voting and the benefits of voting for the democratic India. Students prepared placards and drawn different charts displaying the voting message. Also different slogans on voting such as vote for my India, 100 % voting, my vote for better tomorrow, my vote my right etc., were raised by the students during the rally programme.

Rally on Voter Awareness from Thanjavur old bus stand to Railway station

NSS Special Camp Activities for the year 2019 - 2020

IIFPT conducted NSS Special Camp at Thirukanurpatti village of Thanjavur from 5th May 2019 to 11th May 2019. The following are the glimpses clearly explain the various activities conducted during the above said period. Major activities carried out during the special camp include, health camp (eye and medical camp), cleaning of important common public buildings such as schools, panchayath office, drinking water system, library, etc.

Also, various activities to the school and college students *viz.*, competitions (drawing, essay writing, sports), higher educational opportunities to the college students, etc., Training programmes for the self-help groups, common awareness to the general public on safe storage and use of water resources and management of soil and crop residues, road safety and voter awareness are some of the considerable works carried out during the NSS special camp. State NSS officer. Dr. Kulandaisamy addressed in the valedictory function and motivated the NSS volunteers

IIFPT–NSS Camp – drawing competition to the students

Rally on Voter Awareness from Thanjavur old bus stand to Railway station

and distributed prized to the winners of various competitions. Photographs of various events conducted during the of NSS special camp is enclosed below.

International Yoga day Programme

Institute of Food Processing Technology celebrated 5th International Yoga day on 21.06.2019. It was a grand convergence including of series of events to create awareness on the benefits of Yoga to the public and for the staffs and students of IIFPT. NSS volunteers organized this programme with the help of the NSS coordinator, Dr. R. Meenatchi. On 20.06.2019, IIFPT in collaboration with Ministry of Tourism, conducted mass demonstration on Yoga for the students and for the public at Big Temple, Thanjavur. The programme was held between 6.30 to 8.30 am in the morning. Participants from various groups took part in the event with great enthusiasm. Four trained persons from Isha Yoga helped in explaining different ashanas. It was started with yoga prayer followed by performing various ashanas such as sitting, standing, and laying positions (both lying on back and reverse)

International Yoga Day Programme at Big Temple, Thanjavur

IIFPT – NSS Volunteers taking National Integrity Pledge

Mass Yoga Practice by students & staffs at IIFPT, Thanjavur

IIFPT students taking pledge & Rashtriya Ekta Diwas celebrations at IIFPT

as per the instructions. After the mass demonstrations students shared their experiences. Around 200 NSS volunteers from IIFPT participated in the event.

Innovation day Celebrations at IIFPT

IIFPT NSS volunteers initiated the activity on Innovation day, i.e., 11th October, 2019. On the birthday of Dr. APJ. Abdul Kalam, Dr. Meenatchi delivered a lecture to 1st B.Tech students of IIFPT regarding benefits of differential and forward thinking, importance of finding out need based problem identification and solutions, effective time and energy saving methods useful to the society. The talents and capabilities of the students were accessed for creating student cell to strengthen the NSS activities.

NSS Students of IIFPT celebrating Innovation Day Programme

National Unity Day/ Rashtriya Ekta Diwas Day celebrations at IIFPT

National Unity Day/Rashtriya Ekta Diwas was celebrated at IIFPT in commemoration of the birth anniversary of Sardar Patel. NSS volunteers from 1st and 2nd B. Tech students have taken the National Integrity Pledge at Dr. M.S. Swaminathan Block, IIFPT. A total of 121 students (76 boys and 26 girls) have taken the integrity pledge. Services offered by Shri. Patel, Iron man of India and his role in unity was explained by the NSS coordinator, Dr. R. Meenatchi.

Constitution Day Celebrations

Indian Institute of Food Processing Technology conducted the Constitution Day on 26th November, 2019. NSS volunteers helped in organizing the event. It was a mass convergence of series of events to create awareness about our constitution rights for every citizen in India. In addition, IIFPT with its outreach activities also created awareness

Our honourable Prime minister Shri. Narendra Modi Ji speech through live telecast was observed by NSS volunteers.

Constitution day program at IIFPT honoring the chief guest of the program and chief guest address to the participants

amongst the public especially the youth (school children) towards the constitution rights and duties.

IIFPT students attended the speech delivered by our Honorable Prime Minister Shri. Narendra Modi speech through live telecast. For the benefit of our students, IIFPT conducted speech and debate competitions. The students actively participated in the debate competition and the institute faculty members acted as a judge for the events. On 26th November, 2019 all the staff and students of IIFPT took the Constitution day pledge. Shri. V. Krishnasamy, Senior Panel Member, Government of India, Madurai bench of Madras High Court was the chief guest of the programme.

Dr. R. Meenatchi, NSS coordinator delivered the vote of thanks. On the eve of Constitution day IIFPT also conducted constitution day program in the adopted village, Thirukannurpatti, St. Mary's High School & conducted various competitions such as essay writing, speech and drawing describing the various aspects of the constitution. The students actively participated in all these events. The school students also observed the oath taking process towards the constitution day. Also, special lecture was delivered about our constitution to create awareness among the youth.

The following are the glimpses of the above mentioned programme.

Debate and elocution competition to the students of IIFPT on "Fundamental rights in our Constitution".

Constitution day pledge by Govt. Primary School children at Thirukarurpatti village

To ensure the ethical values in the minds of the young children speech, essay writing and poem writing competitions were conducted to the school children on the eve of our constitution day celebration on 26th November 2019 (Tuesday) in our IIFPT adopted village Thirukannurpatti, St. Mary's High School.

Speech and drawing competition conducted at Thirukanurpatti village on the eve of constitution day celebrations

IIFPT NSS volunteers cleaned Melavasthachavadi Bridge

Liaison Office: Guwahati Swachh Bharath

1. Organized One Day Awareness Programs on Swachh Bharat Mission at Rupnagar Junior Basic School Guwahati on 30.09.2019. The program was attended by Prof. BK Yadav, Dr Goutam Das from, IIFPT and teachers from Rupnagar Junior Basic School. About 120 students attended the program and participated in drawing, quiz, memory test and extempore speech on Swachh Bhart. The Students and participants received refreshments and prizes.

2. Organized one day program under Swatch Bharat Mission at nearby street on 28.10.2019.

3. Organized One Day Intensive Cleanliness Program of Institute laboratory/Training/Incubation Centre under Swachh Bharat Mission at IIFPT, LO,Guwahati on 30.10.2019.

4. Organized One Day Institute Campus Cleanliness Program under Swatch Bharat Mission at IIFPT, LO, Guwahati on 31.10.2019.

5. IIFPT LO-Guwahati & Department of Applied Biology (Food Science & Technology), USTM Meghalaya jointly organized one day workshop on Food Safety & Hygiene for Street Food Vendors under Swatch Bharat Mission Program on 28th November 2019.

Liaison Office: Guwahati

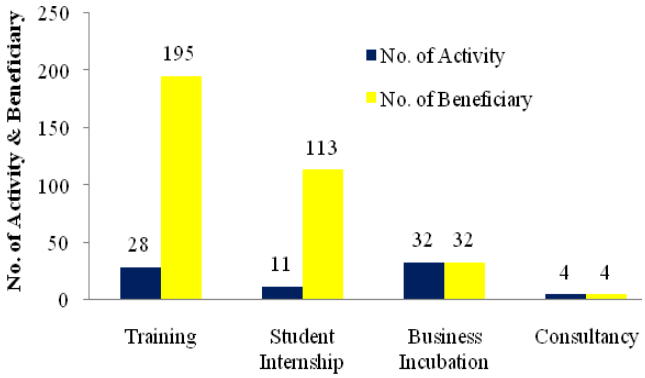
Hon'ble Sri Rameswar Teli, MoS, MoFPI visited IIFPT LO Guwahati and exchanged ideas on expansion of the centre

IIFPT LO Guwahati has been extending training, internship, business incubation, consultancy and outreach services to farmers, students, unemployed youths and entrepreneurs for developing small and medium scale food processing units mainly in Northeast states of India. It has actively been involved in promoting food processing sector through technical consultancy, project evaluation and awarenessprogramme for different central sector schemes (MOVCD NER & PMKSY) in association with NEDFi, state nodal agencies, IIE, ICC, FINER, ASSOCHAM, FICCI etc. The center has been catering students through internship & trainings. Hi-tech equipments have been acquired to establish the food testing facility during this year.

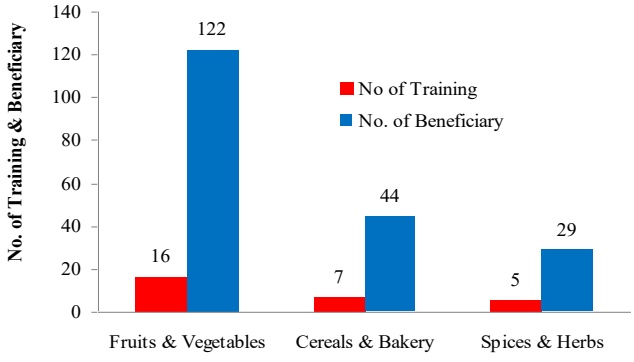
Mr. Chandan Sarma, Successful Entrepreneur of IIFPT LO Guwahati got award from Sri Rameswar Teli, MoS, MoFPI, GoI

Training, Internship, Incubation and Consultancy Services

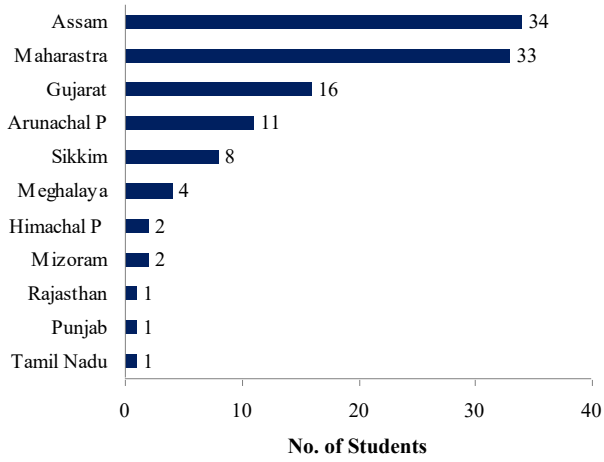
During 2019-20, IIFPT LO Guwahati organized 28 trainings in fruits and vegetables, cereals and bakery, and spices and herbs processing, 11 internships, 32 business incubation and 4 consultancy services for prospective entrepreneurs from all sections of society.



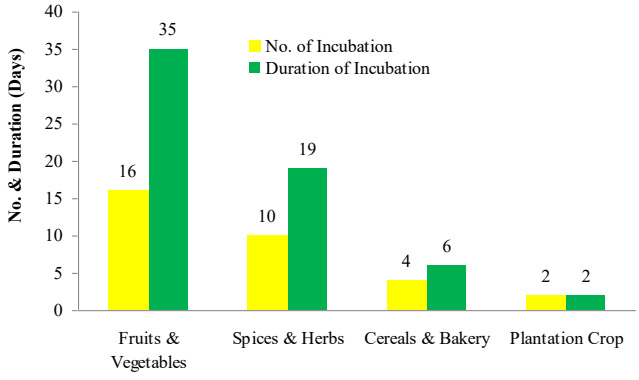
IIFPT LO Guwahati Activities (2019-20)



Trainings in Different Sub-sectors



State-wise Students at IIFPT LO Guwahati



Business Incubation in Different Sectors

Outreach Activities and Implementation of Central Sector Schemes

During 2019-20, IIFPT LO Guwahati faculties have participated as panelists in 17 programmes on promotion of MoFPI's Pradhan Mantri Kisan Sampada Yojana (PMKSY) and other schemes, reached 2240 beneficiaries. Also, organized 22 technical demonstration programmes on food processing technologies and thus reached to about 3000 interested participants. As part of implementation of central sector scheme "Mission Organic Value Chain Development (MOVCD) for NER" under MoA&FW, Govt. of India, IIFPT LO Guwahati has evaluated technical part of 7 food processing projects in Northeast states enabling sanction of Rs. 20634712/- as subsidy along with NEDFi and state nodal agencies.

Participation in NE Food Processing and Machinery Expo Organized by ICC at NEDFi, Guwahati

Successful Entrepreneurs

The following entrepreneurs started new food processing industries in various sectors during the period of 2019 to 2020:

S.No.	Name of the Start-up	Name of the Industry	Brand Name	Product Name
1	Mr. Prahalad Baisnab Baruah Managing Director	Bokakhat Agro Organic Producer Company Ltd., Bachagaon Village, Golaghat District, Assam	Kaziranga Organics	Black Rice Pasta Red Rice Noodles
2	Mr. Moloy Deb	Who Am I Dharmanagar, North Tripura District, Tripura	Bite Changer	Dry Fish Chutney
3	Mr. Gajendran Elavarasi	Y Not Food Products Dispur, Guwahati District, Kamrup Metro, Assam	Y Not	Jam, Jelly, Candy, Beverages, Pickle, Bread, Cake and Cookies
4	Mrs. Nurnehar Ahmed	Tista Industry Maralartari Village Kayakuchi, Barpeta, Assam	Tista	Mixed Garlic, Mango & King Chili Pickles
5	Mr. Kankan Barman	Swapna Food Products Patsala, Barpeta District, Assam	Swapna	Jam, Jelly, Pickle, RTS & Squash

Snapshots

IIFPT

Liaison Office: Bathinda

Introduction

The financial year of 2019-20 has been proved a very productive year for FPBITC & Liaison Office, IIFPT, Bathinda in terms of development & expansion of various kind. An overwhelming response from in and around people of Bathinda, Punjab and nearby states for short term & long term skill trainings and utilisation of Business Incubation Centre during the year and is quite remarkable and highly appreciable. The activities and number of visitors were at a high rise. Most of the scheduled trainings were conducted with the presence of enthusiastic participants. Many trainings and programmes were also conducted on request of farmers from others different villages, SHGs as well as NGOs.

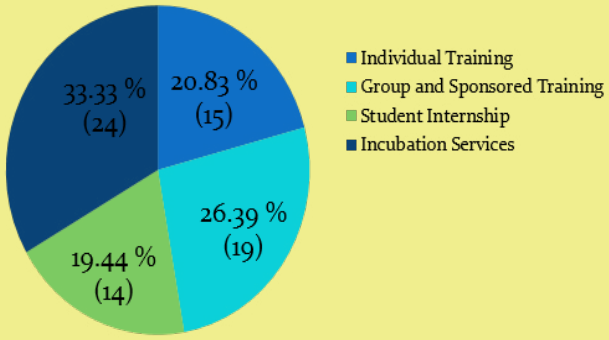
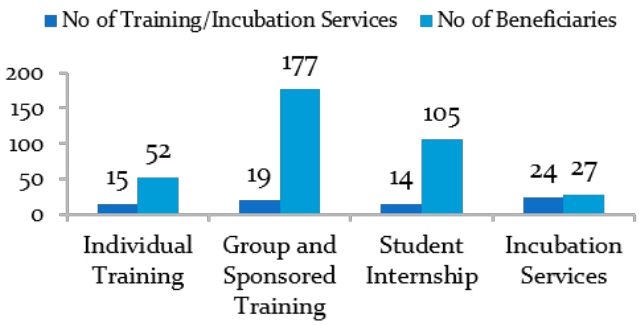


Fig. 1: Distribution of Different Services during 2019-20

Training and Incubation Services

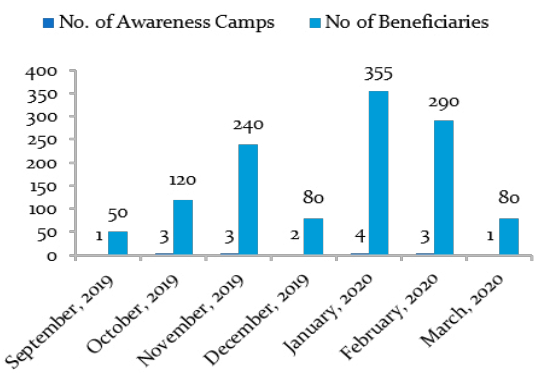
During the Financial Year 2019-20, the center has delivered 72 services including short & long term training programmes (48) and business incubation services (24). Among the 361 beneficiaries' 334 members successfully participated in the trainings and 27 members have taken incubation services for flourishing their business using FPBITC facility. The training programmes included both conceptual and practical demonstration. The incubation services were provided to individual person, groups and SHG's for processing and packaging of different food products *viz.* curd, fruit pulp, fruit beverages, chocolate, packaged cereals, pulses, powders etc. towards flourishing their business on small scale level by utilizing FPBITC incubation facilities. Student internship contributes the maximum share of the total revenue generation followed by group and sponsored trainings.



Details of the trainings / internship and Incubation Service

Outreach Activities

In addition to the core activities, many outreach off-campus activities were performed to aware farmers, youth, women and entrepreneur about the services avail by IIFPT LO, Bathinda and MoFPI schemes to make beneficial by utilizing these for creating opportunities of income generation in food processing sector. Many outreach activities have been organized during April 2019-March 2020. The LO has organized one day awareness programmes in different institutions or Punjab including Bathinda region. More than 1200 Beneficiaries including farmers, farm lady, youth, women and students were benefitted through 17 awareness programmes.



Details of the Awareness Camps during 2019-2020

Other Extension Activities

IIFPT LO-Bathinda officials Participated in Radio talks, External agencies lectures, Food expo, Kisan Mela, etc.

Invited Lectures / Radio Talks

The IIFPT-LO, Bathinda officials delivered lectures on "Opportunities in Food Processing Sector" in Mass awareness camp organized for women SHG's by NGO Hand in Hand, India; 'Farmers Awareness Meet' by NABARD & Dr. Ambedkar Chamber of Commerce for welfare of farmer, youth and farm women. Accounting value of Mass Media, IIFPT-LO, Bathinda officials also delivered radio talks on AIR, Bathinda and On AIR 90.8 FM, run by SGTBK College, Shri Anandpur Sahib for reaching up to those peoples whom we cannot reach directly.

Participation in Kisan Mela/Food Expo

IIFPT-LO, Bathinda participated and exhibited IIFPT stall in different Kisan Melas, ANUFOOD-2019, Vision Rajasthan-2019, Agri-Business Incubator Conclave, Organic Food Festival, Exhibition cum Workshop on Technologies in Food Processing organised by CSIR, Food Processing Summit 2020 by Invest India and funded by MoFPI for creation of awareness among farmer, entrepreneur, industrialists, students and youth etc.

Organized Workshop / Event

The IIFPT-LO, Bathinda organized workshop cum demonstration of "Industry on Wheel" i.e. Mobile Food Processing Unit (MFPU) funded by MoFPI at Bathinda, Ludhiana and Jalgaon. The IIFPT signing of MoU with eight institutes of Punjab and Haryana in the presence of Hon'ble Union Minister, FPI Smt. Harsimrat Kaur Badal. Two days workshop was organised on the occasion of "International Women Day" in which "Training cum Demonstration Session" was conducted for welfare of farm women during April 2019-March 2020.

Visits Arranged

During April 2019-March 2020, the IIFPT-LO, Bathinda arranged visits for school and college students and trainees from different organization. Around 1300 Beneficiaries including students, farmers and farm women were benefitted through 14 exposure visits.

Snapshots


PRASAR BHARATI
INDIA'S PUBLIC SERVICE BROADCASTER
ALL INDIA RADIO:BATHINDA


IIFPT
Indian Institute of
Mobile Foo


Indian Institute of Food Processing Technology
Two Days Workshop on the occasion of
International Women's Day


BAKERY SECTI

IIFPT

Board & Executive Committee Members

Members of Governing Body

1. **Smt. Pushpa Subrahmanyam**
   Chairman–IIFPT Board
   Hon'ble Secretary, Ministry of Food Processing Industries
   Panchsheel Bhavan, August Kranti Marg
   New Delhi 110 049

2. **Shri. Minhaj Alam**
   Joint Secretary
   Ministry of Food Processing Industries
   Panchsheel Bhavan, August Kranti Marg
   New Delhi 110 049

3. **Shri. Praveen Garg**
   Additional Secretary and Finance Advisor
   Ministry of Food Processing Industries
   PanchsheelBhavan, August Kranti Marg
   New Delhi 110 049

4. **Shri. Gagandeep Singh Bedi**
   Agricultural Production Commissioner &
   Principal Secretary
   Department of Agriculture
   Government of Tamil Nadu
   Chennai 600 009

5. **Dr. V.R. Sagar**
   Principal Scientist
   (Nominated by Director, IARI)
   Indian Agricultural Research Institute
   Pusa, New Delhi 110 012

6. **Dr. H.S. Gupta**
   Former Director General
   Borlaug Instt. for South Asia (BISA)
   New Delhi

7. **Dr. S. Uma**
   Director
   National Research Centre for Banana
   Thogamalai Road
   Thayanur PO, Tiruchirapalli 620 102

8. **Dr. Pitam Chandra**
   Ex-Professor (FE) NIFTEM &
   Former Director -ICAR-CIAE, Bhopal
   CD 223, Ansal Golf Link I,
   Greater Noida 201310 UP

9. **Shri. Abishek Abraham**
   (Nominated by Shri. Padma Singh Issac)
   Aachi Masala Foods (P) Ltd.
   Plot No.1926 34th Street,
   Ishwarya Colony I Block,
   Anna Nagar West, Chennai 600 040

10. **Shri. Shree Shivkumar**
    Chief Executive Officer
    SKM Egg Products Exports (India) Ltd.
    185, Chennimalai Road, Erode - 638001

11. **Shri. J.S. Syju**
    General Manager (TN)
    Food Corporation of India
    No.8, Mayor Sathyamoorthy Road
    Chetput, Chennai 600 031

12. **Dr. B. Shridar**
    Dean
    Agricultural Engg. College & Res. Institute
    Tamil Nadu Agricultural University
    Coimbatore 641 003

13. **Dr. C. Anandharamakrishnan**
    Director-Member Secretary
    Indian Institute of Food Processing Technology
    Thanjavur 613 005

Executive Committee Members

1. **Shri. Minhaj Alam**
   Joint Secretary
   Ministry of Food Processing Industries
   Panchsheel Bhavan, August Kranti Marg
   New Delhi 110 049

2. **Shri. Praveen Garg**
   Additional Secretary and Finance Advisor
   Ministry of Food Processing Industries
   PanchsheelBhavan, August Kranti Marg
   New Delhi 110 049

3. **Shri. Sanjay Kumar Singh**
   Deputy Secretary
   Ministry of Food Processing Industries
   Panchsheel Bhavan, August Kranti Marg
   New Delhi 110 049

4. **Ms. Chayaa Nanjappa**
   Founder Partner
   Nectar Fresh- Pure Honey & Food Products
   #149/2, Brahmapura Village
   Naguvanahalli Post, Srirangapatna Taluk,
   Mandya District – 571 438

5. **Dr. Saraswathy Eswaran**
   Former Professor of TNAU
   29, Vallalarnagar,
   Vadvalli, Coimbatore 641 041

6. **Dr. Srinivasulu Naladala**
   Head
   Technology Development and
   Innovation Entrepreneur
   General Mills India Pvt. Ltd.
   Mumbai 400 076

7. **Dr. C. Anandharamakrishnan**
   Director – Member Secretary
   Indian Institute of Food Processing Technology
   Pudukkottai Road
   Thanjavur 613 005

Audit Statement

INDIAN INSTITUTE OF FOOD PROCESSING TECHNOLOGY
MINISTRY OF FOOD PROCESSING INDUSTRIES, GOVERNMENT OF INDIA
PUDUKOTTAI ROAD, THANJAVUR-613005, TAMIL NADU

BALANCE SHEET AS ON 31.03.2020

Particulars	Schedules	31.03.2020 Amount (₹)	31.03.2019 Amount (₹)
CORPUS/CAPITAL FUND AND LIABILITIES			
CAPITAL FUND	1	1,383,562,785	822,635,135
RESERVES & SURPLUS	2	249,232,405	178,460,811
CURRENT LIABILITIES AND PROVISIONS	3	47,048,757	61,537,204
TOTAL		1,679,843,947	1,062,633,150
ASSETS			
FIXED ASSETS	4	827,850,968	389,711,073
CAPITAL WORK-IN -PROGRESS	5	137,877,410	79,997,555
BALANCES WITH BANKS	6	679,081,821	498,495,852
CURRENT ASSETS,LOANS AND ADVANCES ETC.,	7	35,033,748	94,428,670
TOTAL		1,679,843,947	1,062,633,150

For J.Karthik Bharathi & Co.,
Chartered Accountants
FRN: 010333S

J. KARTHIK BHARATHI & CO. CHARTERED ACCOUNTANTS FRN 010333S CHENNAI-600 105

S.Baskaran
Partner
M. No. : 211403

Dr. C. Anandharamakrishnan, Ph.D(UK),FRSC
Director
Indian Institute of Food Processing Technology
(Ministry of Food Processing Industries, GoI)
Pudukkottai Road, Thanjavur-613 005,TN.

Date: 30/10/2020
Place: Chennai

INDIAN INSTITUTE OF FOOD PROCESSING TECHNOLOGY
MINISTRY OF FOOD PROCESSING INDUSTRIES, GOVERNMENT OF INDIA
PUDUKOTTAI ROAD, THANJAVUR-613005, TAMIL NADU

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31.03.2020

Particulars	Schedules	31.03.2020 Amount (₹)	31.03.2019 Amount (₹)
INCOME			
GRANT/SUBSIDIES	8	186,994,247	168,978,650
FEES/SUBSCRIPTIONS	9	59,968,693	62,108,317
INCOME FROM SALE/SERVICE	10	4,695,457	4,852,026
INTEREST EARNED	11	29,604,731	26,053,672
OTHER INCOME	12	17,693,484	22,064,830
TOTAL (A)		298,956,612	284,057,495
EXPENDITURE			
ESTABLISHMENT EXPENSES	13	133,841,357	120,505,659
OTHER ADMINISTRATIVE EXPENSES	14	94,028,267	103,616,600
DEPRECIATION	15	315,394	355,531
TOTAL (B)		228,185,018	224,477,790
EXCESS OF INCOME OVER EXPENDITURE (A-B)		70,771,594	59,579,705

Dr. C. Anandharamakrishnan, Ph.D(UK)., FRSC
Director
Indian Institute of Food Processing Technology
(Ministry of Food Processing Industries, GoI)
Pudukkottai Road, Thanjavur-613 005, TN.

Date: 30/10/2020
Place: Chennai

For J.Karthik Bharathi & Co.,
Chartered Accountants
FRN: 010333S

J. KARTHIK BHARATHI & CO. CHARTERED ACCOUNTANTS FRN 010333S CHENNAI-600 105

S.Baskaran
Partner
M. No. : 211403