

**INDIAN INSTITUTE OF
FOOD PROCESSING TECHNOLOGY**
Ministry of Food Processing Industries, Government of India
Pudukkottai Road, Thanjavur, Tamil Nadu



**Annual Report
2016 – 17**



**वार्षिक रिपोर्ट
2016 – 17**

**भारतीय खाद्य प्रसंस्करण प्रौद्योगिकी संस्थान
खाद्य प्रसंस्करण उद्योग मंत्रालय, भारत सरकार
पुदुक्कोट्टै रोड, तंजावूर, तमिलनाडु**



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Foreword

India is strongly poised to become world leader through Make in India and many other flagship schemes and programs. With a strong interdisciplinary teaching and research credentials in Food Science and Engineering, Indian Institute of Food Processing Technology (IIFPT) under the Ministry of Food Processing Industries, Government of India is best positioned to contribute to the national effort for an enhanced food safety and security.

The Institute has nine departments with well equipped laboratories viz. Food Biotechnology, Food Safety and Quality Testing, Food Engineering, Food Packaging and System Development, Food Product Development, Primary Processing, Storage and Handling, Computational Modeling and Nanoscale Processing Unit, Technology Dissemination and Academics and Human Resource Development. In addition, the Institute has a Food Business Incubation Centre to house entrepreneurs and start ups to get exposed and become trained manpower in different food processing technologies related to the processing of various plant and animal-based foods. We are proud to have achieved ISO & HACCP certification which attests to the robustness and quality of our Food Processing Business Incubation process. Hands-on-training on different food processing technologies, renting facilities and other supports are offered all throughout the year to help the entrepreneurs to put in their innovative ideas for the development of new products.

Our Food Safety and Quality Testing Laboratory is ISO 17025:2005 NABL accredited and a FSSAI referral laboratory. IIFPT has now become a symbol of quality education in developing food process engineers and food safety & quality managers in our country. IIFPT also offers B.Tech., M.Tech. and Ph.D. programs in Food Process Engineering and M.Tech programs in Food Science and Technology. Our FST and FPE students have exclusive overseas immersion for study trips and academic exchange, as well as priority internship selection in food MNCs and local SMEs. They will also have food industry mentorship opportunity, food industry visits and lecture series by food industry leaders.

We are proud of being a very familiar name in a short span of time among the food processing research institutions in India to take a part in ensuring the food safety and security aspects. We welcome farmers, investors, entrepreneurs, joint venture partners, technology developers, research institutions and startup ideas to come and join us for the next stage of food revolution.

Together with our dedicated Faculties from IIFPT, we warmly welcome you to embark on this exciting journey towards a future-ready food industry!

Dr. C. Anandharamakrishnan
Director

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INTRODUCTION



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, again rechristened as Indian Institute of Food Processing Technology.

The Institute began offering formal degree courses at bachelor's, master's and doctoral levels in Food Process Engineering from 2009-10 academic year. Student intake for B. Tech., M.Tech. and Ph.D. program is 60, 15 and 5 respectively. IIFPT has commenced M.Tech (Food Science and Technology) program during 2013-14 academic year and 15 students are being admitted in this program every year.

The institute is having 24 on-going externally funded projects which include 17 National, 2 International projects and 5 industrial projects. We have successfully completed Onion Mission programme at Perambalur District, Tamil Nadu. In addition, 2 M.Tech students completed their research work at ONIRIS, France, one Ghana scholar and one from Central African Republic completed their research at IIFPT under RTF-DCS fellowship scheme of DST. One ICAR probationary scientist is undergoing the professional attachment training at IIFPT during the present period.

IIFPT has conducted a number of outreach programs across the country. During April 2016 – June 2017, IIFPT organized several programs which includes 91 Beginners Training for entrepreneurs, 27 Executive Training for new entrepreneur, 51 Technical Guidelines cum Trainings and 95 Training cum Incubation Services. Around 12 Mobile Processing Unit trainings were conducted all over India. In order to disseminate the scientific outcomes and popularize and create awareness about food processing, 13 conferences and 4 Food Industry Stakeholder/IIFPT Beneficiaries Meet were conducted.

The Liaison Office of IIFPT was established at Guwahati, Assam in July 2010. Infrastructure such as Food Processing Trainings cum Incubation Center, training class rooms, trainees' hostel and office room were set up in a rented building. During April 2016 – June 2017, 55 skill development training programmes were conducted through which 533 people were benefitted. Also, 116 students underwent in-plant training and 59 incubation services were offered in this period. Farmers, SHG members and educated youth benefitted by such trainings. IIFPT Liaison Office at Bathinda, Punjab was started in November 2016 and the institute is working on modalities to establish a full-fledged food processing business incubation center in the region.

IICPT renamed as Indian Institute of Food Processing Technology (IIFPT)

The Indian Institute of Crop Processing Technology (IICPT) has been renamed as Indian Institute of Food Processing Technology (IIFPT) by Smt. Harsimrat Kaur Badal, Hon'ble Union Minister, Ministry of Food Processing Industries on 31.3.2017. 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 will diversify its prospects for intensive research and development activities in the areas of fish, meat, poultry and dairy processing. It will take 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.



Smt. Harsimrat Kaur Badal, Hon'ble Union Minister, Ministry of Food Processing Industries formally announcing the renaming of IICPT to IIFPT on 31.3.2017

Vision



- To serve as a National Institution for research, education and training in the area of post harvest processing of crops of wetlands and storm prone regions.
- To undertake basic, applied and adoptive research in post-production sector of cyclone/storm prone areas and wetlands, also including plantation, spices and other important crops.
- To undertake transfer of technology, consultancy and analytical services for raw and processed agricultural commodities.
- To establish linkages with related processing industries and other academic as well as R&D institutions for achieving its goals effectively.

Mission



- Gaining an increased understanding of living organisms with a view to increasing its application in the grain industry.
- Developing a strong human resource capacity for the processing industry.
- Providing a sound scientific basis for decision making in food security, safe environment and addressing the concerns of the consumers.
- Generate and upgrade the scientific knowledge in the area of food grains for maximizing, conservation and utilization of food grains.
- Value addition to the food grains and development of food products with safety through the application of newer technologies by R&D work.

- Assist the existing industries for better performance in terms of efficient functioning, by-product utilization and effluent management.
- Promote growth of new food industry, entrepreneurship, upgrading the skill of industrial manpower and management by imparting training programme.
- Storage of grains, insect pest management and safeguarding the quality of food grains and products.
- Shelf-life improvement of food grains/products by packaging and improved technology.
- Environmental protection and work safety measures in food industries.

National Institutional Ranking

The National Institutional Ranking Framework (NIRF) which was approved by the MHRD and launched on 29th September 2015. This framework outlines a methodology to rank institutions across the country. The methodology draws from the overall recommendations broad understanding arrived at by a core committee set up by MHRD, to identify the broad parameters for ranking various universities and institutions. The parameters broadly cover: teaching, learning & resources, research and professional practice, graduation outcomes, outreach and inclusivity and perception.

The Indian Institute of Food Processing Technology (IIFPT) has secured **87th rank in the overall category in NIRF 2017 ranking.**

Further, considering **Teaching, Learning & Resources** (i.e. student strength including doctoral students, faculty-student ratio with emphasis on



IIFPT ranked 87th in Overall Ranking, 27th in Outreach & inclusivity and 32nd in Teaching, Learning & Resources

permanent faculty, combined metric for faculty with PhD (or equivalent) and experience and, total budget and its utilisation), IIFPT ranked 32nd in the country. Also, in the category '**Outreach and Inclusivity**' (i.e. percent students from other states/countries, percentage of women, economically and socially challenged students, and facilities for

physically challenged students), IIFPT ranked 27th in the country.

The rankings include all institutes/universities of engineering, sciences, management, pharmacy and others, and it is indeed a great achievement for IIFPT to come up to this level with the very small team of 27 faculties and 280 students.

ESTABLISHMENT OF NEW DEPARTMENTS/ FACILITIES

2

COMPUTATIONAL MODELLING AND NANOSCALE PROCESSING UNIT

This recently launched unit focuses on the application of computational fluid dynamics in various agri-food processing applications. Modeling is a powerful tool for optimizing and improving process control over various unit operations by acquiring an in-depth understanding of the intricate transport phenomena in food systems. The unit uses advanced computing methods and undertakes industry and other external funded research projects in this field.

Further, considering the potential of nanotechnology, the unit also conducts studies on nano-level food processing. This includes strategies for nanoencapsulation, nanoemulsions, nano delivery systems, nanopackaging and other advanced applications. Research and development on various aspects of nanostructured foods, nanocarrier systems, nano food additives, nanocoatings, and development of nanosensors are under progress.

DEPARTMENT OF FOOD BIOTECHNOLOGY

Biotechnology in the food processing sector makes use of micro-organisms for the preservation of food and for the production of a range of value-added products such as enzymes, flavour compounds, vitamins, microbial cultures and food ingredients. Therefore, facilities were created for the selection and manipulation of micro-organisms with the objective of improving process control, product quality, safety, consistency and yield, while increasing process efficiency. In an effort to address the future expectations of stakeholders in post-harvest management and food processing sector through food biotechnological research and development innovations, it becomes necessary to build a Food Biotechnology Department.

Recombinant gene technology, genetically modified (GM) microbes/food for sustainable development

and nutrition will also be catered to, by harnessing the potential of biotechnology. Biotechnology is also widely employed as a tool in diagnostics in order to monitor food safety, prevent and diagnose food-borne illnesses and verify the origins of foods.

NATIONAL ACCREDITATION BOARD FOR TESTING AND CALIBRATION LABORATORIES (NABL) AND REFERRAL LABORATORY

Indian Institute of Food Processing Technology (IIFPT) Thanjavur, has world class hi-tech food testing laboratory accredited by *National Accreditation Board for Testing and Calibration Laboratories* (NABL) which is valid till 2019, in compliance with ISO/IEC17025:2005 for both Chemical and Biological testing of food and food products. This is the only lab in Tamil nadu recognized by FSSAI as **Referral Laboratory**. Our food testing laboratory is one of its kind and unique in serving the food industries, research institutes and other stake holders in areas of food processing. The NABL scope of accreditation covers 76 chemical parameters covering food grains, oils and fats, oil seeds, seed cake, cereal and cereal products, spice and condiments, fruits and vegetables, food additives, milk and milk products, water such as bore well water, packaged drinking water and 34 biological parameters of the food & agricultural products and water. The food testing industry works closely with manufacturers to ensure that all products are scientifically tested and proved to be safe for human consumption at a variety of stages, from raw material to production line, to finished product.

Our Food Testing Laboratory is equipped with wide range of hi-tech equipments from sample preparation to analysis of food composition, textural properties, viscosity, elemental analysis, pesticide residues, antibiotic residues, toxin analysis and phytochemical analysis in food grains & water. Physico-chemical characteristics and nutritional labeling is also done

here. We offer testing services to food processing industries such as rice processing, pulse processing, edible oil industries, exporters, importers, pharma and biotech industries, self-help groups, small scale food industries, food business operators, academicians, researchers and students. A common set of scientific techniques are used to analyze, assess and record the safety and viability of a product in terms of microbiological stability and chemical composition. Latest analytical techniques and validated methods of International Organizations like AOAC, AACC and BIS standards for analyzing /testing of food and food products for the chemical and biological testing. We also provide training on food quality and safety analysis, hands on training on operation of hi-tech equipment viz., LC-MS-MS, Preparative HPLC, HPLC, GC-MS-MS, GC-MS, ICP-MS, ICP-OES, Amino Acid Analyzer, Ion Chromatography, FTIR and NMR. The laboratories is strengthened with well-trained scientific and technical personnel to offer accurate, reliable and traceable analytical results to customers.

ESTABLISHMENT OF GYM IN GIRLS HOSTEL

A gym was established in the girls' hostel and inaugurated by Sh. Avinash Kumar Srivastava, Secretary in presence of Sh. Rajiv Mishra, Economic Adviser, Ministry of Food Processing Industries, Government of India on 10.2.2017.

IIFPT KNOWLEDGE CENTRE

The objective of Knowledge centre is to provide comprehensives resources and services in support of the research, teaching, and learning needs of the Institute members and food sector stakeholders as well.

The Knowledge centre has many collections namely, books, encyclopedia, dictionary, Competitive exam books, Tamil and English novels, journals, magazines used by the research scholars, students of PG and UG Students of Indian Institute of Food Processing Technology.

About 30000 documents consisting of technical books, reports, standards, CD-ROMS and back volumes of journals are available at IIFPT's Knowledge Centre. The library subscribes 54 periodicals (print) and 1500+ e-books besides a holding of 840 back volumes of journals. Wi-Fi facility has been provided for laptop users and DELNET e-resources are also made available for the students.

DETAILS OF PUBLICATIONS

S.NO.	TITLE	AVAILABLE IN NOS.
1.	No. of Books	28742
2.	Annual Reports	309
3.	Proceeding	619
4.	Back Volumes of Journals	840
5.	Reprints	6200
6.	Indian Journal	20
7.	Magazines	54
8.	Textbook Multi Copies	2333
9.	IIFPT Thesis	137
10.	External Project Thesis	340
11.	Online Resource	2
12.	News Daily	7

ESTABLISHMENT OF LIAISON OFFICES

3

LIAISON OFFICE, BATHINDA

Aiming to support farmers, budding entrepreneurs, self help groups, students, industries for providing technical guidance, skill development, training, incubation and consultancy services for various stakeholders of Central & North India, IIFPT established a Liaison Office to cater to the food processing requirements for training and skill development in the region. IIFPT also planning to establish one Food Processing Business Incubation Centre (FPBIC) in Bathinda(Punjab) to transform farmers' food product concepts and ideas into a successful thriving business and become a food entrepreneur.

IIFPT participated in Kisan mela in the month of September, 2016, organized by PAU for mass awareness on food processing and value addition and to promote the centre activities. Liaison office also jointly organized one day national seminar on Recent Trends in Food Processing at Central University of Punjab, Bathinda on 9th December 2016. This seminar was held to provide a national forum to academicians, scientists, researchers, students, small entrepreneurs and food processing industries, to discuss the growing advancement and recent techniques in the sector of food processing. The event was a great success and attended by approximately 380 participants including students, academicians, entrepreneurs and industry people.



This centre will offer short and long term hands-on training to rural youth, women self help groups, producers, students, new and experienced entrepreneurs and other stakeholders and technical consultancy services for the establishment of food industries. The facilities including the equipment and machinery would be given on rental basis to stakeholders who wish to produce and market their produce before venturing in the food processing businesses.

LIAISON OFFICE, GUWAHATI

During the financial year of 2016-17, all the regular activities along with certain up-gradation have been done. The productivity of the office has been tried to be realized up-to optimum potential. While a total of 169 days have been occupied by beginners' training through 43 trainings with 460 trainees altogether, 4 internship programs with three 15-day training and one 30-day training consisting of 116 students have been conducted. Besides training, four firms/ individuals have been enrolled under consultancy services during the period. The third aspect of the activities of the office is incubation services i.e. renting out premises, machineries and facilities for the upcoming entrepreneurs and beginners. In this period, a total of 41 incubation services have been given out. Many visitors, individual and groups, have been entertained to demonstrate the facilities



at the office, precisely 168 common visitors, 6 groups and one group of scholars.

Besides core activities, to cope with the increasing activity demands, new recruitments have been done for a contractual post of Professor and one SRF. On capacity of all the workers combined, eight publications have been individually published including conference papers, book chapters and abstracts. Officially and on individual capacity, 10 seminars/conferences, 20 invited lectures and 24 meetings have been attended by the faculties and SRFs. The office also organized 4 mass programs including one APEDA collaborated workshop, one NIFTEM-collaborated one day training, one week activity on Nutrition Week and one brainstorming session. The office also established and maintained many external linkages,

including 36 government organizations, 2 private organizations, 5 industries and 7 NGOs. Along with it, 12 projects have been handled by the staff during the period in the fields of research, skill development and infrastructure development, two of which have been completed including NERLP Skill Development project and one student project work from AAU, Jorhat, one project with IIE is being carried out on consultancy basis on Buckwheat and Rice Bran.

On the front of documentation, in this period, 44 success stories have been traced and documented. Also, workshop manual, training manual, reports, etc. have also been prepared. The electrical capacity has been upgraded up to 30 KVA. The office also entertained overall 478 enquiries, both telephonic and through e-mail during the period.

ACADEMIC ACTIVITIES

IIFPT offers the following academic programs:

- B. Tech. (Food Process Engineering)
- M. Tech. (Food Process Engineering)
- Ph. D. (Food Process Engineering)
- M. Tech (Food Science & Technology)

The intake of students includes 60 in B. Tech., 15 in each of the M. Tech. degree programs and 5 in Ph.D. degree program. The B. Tech. degree is usually of 4 years or 8 semesters duration, M. Tech. degrees are of 2 years or 6 Trimesters duration and Ph.D. degree is of 3 years or 9 Trimesters duration.

IIFPT sends undergraduate students for short term exposure and graduate students for long term research projects in reputed international institutions and advanced laboratories around the world. These training and research exposures help to create leaders in food processing who can take Indian food processing sector to greater heights. IIFPT also sends the undergraduate students to India's villages to learn the firsthand problems faced by producers and the current status of production, storage, handling, and marketing of foods.

SCHOLARSHIPS & AWARDS TO STUDENTS

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



- Institute Merit-cum-Means Scholarship for 5 of students from each batch @Rs.1,000/- pm.
- Institute free studentship: for 1 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.

International Collaboration for Student Research

International Institution/University	Progress Made
ONIRIS, France	Three students of IIFPT and three students of ONIRIS mutually exchanged for academic research program

Graduation Day 2016-17

The 2nd Graduation Conferring Ceremony for M.Tech. & Ph.D students (2009, 2010 & 2011 batches) was held on 30.08.16 at Dr. A.P.J Abdul Kalam Hall.



The chief guest for the function, Dr. T. Ramasami, Former Secretary, Ministry of Science & Technology, Govt. of India and Guest of honour Smt. Chayaa Nanjappa, Founder, Nectar Fresh, distributed the awards and certificates to the graduates.

Student Hostels

IIFPT has separate hostels for men and women with well furnished rooms equipped with state-of-the-art facilities, reading rooms, television and music rooms. The hostel messes provide nutritionally balanced, wholesome and tasty food and the dining charges are based on a dividing system. The hostel is run by the students under the supervision of Deputy Wardens for men's and women's hostels. New hostel facilities are being built to accommodate the students. Hostel life at IIFPT is a mixture of fun and learning. Indoor and outdoor games and gym facilities are available.

IIFPT's Annual, Hostel and Sports Day



The Annual Day, Hostel Day and Sport meet was conducted on 5th May, 2017. The Chief guest for the function was Thanjavur District Collector Mr. A. Annadurai IAS and Guest of honor was Dr. N. Nagendra Gandhi, Professor & Head, Dept. of Chemical Engineering, Director, Institute of Catalysis and Petroleum Technology, Anna University, Chennai.

The sports and games events were conducted by dividing the students in to three houses viz., Blue, Green, and Red. The intramural matches for the annual sports meet were conducted between the

houses from 25th April to 3rd May 2017 for the following events for boys and girls Students separately.

- Cricket, Football, Kho-Kho, Badminton, Table Tennis, Volleyball and Athletics.
- Badminton, Chess, Kho-Kho, Throwball, Table Tennis, and Athletics.

The prizes were distributed for the winners and runners for the games and athletic events. The Individual championship was also awarded to the following champions who secured highest score in the athletic events.

Student's Exposure to Industry



Students of B.Tech and M.Tech are visiting various food processing industries and institutions all over India as per the course curriculum and learning practical experience.

Students Farewell Day

The Farewell Day for the final year B.Tech. students-2013 Batch was organized on 6th May, 2017. The outgoing students shared their thoughts about their stay at IIFPT for the last 4 years. They mentioned the fact that the discipline and the opportunities generated here in IIFPT, the things taught, not only the subject matter, but also the team work, interaction, participating in sports, cultural activities, visits had made a difference in their life and now they are more confident in facing the highly competitive world.



Extra-curricular Activities of Students

Students of IIFPT actively participated in various activities including club day programs, sports activities and other extra-curricular activities. IIFPT students have also won laurels at several inter-collegiate platforms. Extra-curricular activities are a part of student life at IIFPT.

NSS Annual Activities (2016-17)

The volunteer students of IIFPT-National Service Scheme (NSS) have conducted many events in and around the campus during 2016-2017. During the regular NSS activity, the unit conducted programmes viz., Quiz competition on Make in India Concept, Awareness on Technological Abuses, Women's Day Celebration, Campus beautification activity, Blood donation camp, Workshop on "Cleanliness and waste management in offices, Food safety awareness campaign for street

vendors, Training on Vermi-composting of Farm waste, Observance of Rashtriya Ekta Diwas & Rashtriya Ekta Saptha, Observance of Vigilance Awareness Week, Promotion of use of digital modes of transactions due to demonetization, World cancer day, National Productivity week celebration, Pre-hospital Trauma Care Medical awareness programme and Road Safety Awareness Programme in the campus.

Apart from the regular activity, the students have conducted a special camp at Sethurayankudikadu Village, Thanjavur District from 01.05.2016 to 07.05.2016. During this programme the students have conducted many events in the village to create awareness on many social issues in the rural community. The major events addressed are personal hygiene camp for school children, awareness programme on childline, yoga awareness, Disaster management, cleaning of street, schools and common places, Tree planting and kitchen gardening.



Snap shots of NSS activities

PLACEMENTS

Degree Programme	No. of Students Enrolled	No. of Students Placed in Industry	No. of Students Selected/Opted for Higher Studies	Appointed as Faculty / Start-Up Own Business
B.Tech	34	33	22	02
M.Tech	18			
Ph.D	03			

M.Tech & B.Tech Placements

Industry Wise Placement details		
Sl.No.	Food Industries	No. of Students Placed
1	MTR Foods Ltd., Bangalore	1
2	Food Buddies, Chennai	2
3	SRG Organics, Chennai	2
5	Big Basket	1
6	Nectar Fresh, Mysore	2
7	Future Groups	2
8	Reliance Industries Ltd.	4
9	Aachi Masala, Chennai	2
10	Food Fortification Initiative, Chennai	3
11	CCM, Hyderabad	3
12	Cavin Kare, Chennai	1
13	Occiana Foods, Pondichery	2
14	Pepsico India Pvt. Ltd.	1
15	A2B, Chennai	2
16	Naga Foods, Dindigul	1
	Total	29

Students Joined for Higher Studies – PG

Sl.No.	Name of the Institute/University	No. of Students*
1	MANAGE, Hyderabad	3
2	IRMA, Anand	1
3	NIAM, Jaipur	1
4	NIFTEM, Haryana	2
5	CFTRI, Mysore	1
6	Central University, Assam	2
7	IIFPT, Thanjavur	10
8	Kansas State University, U.S.	1
9	Dublin, Ireland	1
10	IIT, Delhi	1
11	Vigyan University	4

SWACHH BHARAT ACTIVITIES

6

Indian Institute of Crop Processing Technology is regularly conducting Swachh Bharat Abhiyaan program twice in a month (alternate Tuesdays) with all staff and students.

As per the notification from Ministry, IICPT have observed Swachh Bharat Pakhwada during 15th–30th April 2016 with the following activities.

- Awareness campaign against littering and segregation of waste to the casual labours, lab attenders, house keeping people and people living in institute quarters.
- Essay writing in Hindi on the Topic “Your dream about clean and green India” to students of IICPT
- Debate competition in English on the topic “Use of plastics should be banned”
- Quiz competition on Waste disposal and effective utilization of waste.
- Pledge has been taken by all staff and students of IICPT against littering on 26.04.2016.
- Entire IICPT campus is divided into 12 sections and cleaning, beautification and maintenance of individual sections will be given to particular groups. Group leaders of each group will monitor the activities throughout the period and prizes will be awarded for the best group.
- Prizes were distributed to the winners of various competitions on the eve of Sports Day of IICPT.



THEMATIC CLEANLINESS DRIVE AT IICPT (16.05.2016 TO 31.05.2016)

IICPT have observed “Thematic cleanliness drive” from 16.05.2016 to 31.05.2016 under swachh bharat mission with the following activities.

- Cleaning the individual’s cabins, administrative office and library.
 - All staff and students cleaned their respective workplaces and class rooms. Old materials, unused materials, papers etc. were removed and discarded.
- Discarding the old files and papers from individual’s cabins as well as administrative office.
 - From administrative office and individual offices of staffs all the old files and papers were removed and new files were arranged properly.
- Swachhtha shapath was taken by all staff and students for making India clean and green as dreamt by our father of nation Mahatma Gandhi.
- Discarded all the scrap materials from the campus.
- Essay writing competition in Hindi on the Topic “Role of students in making Clean India”. Prizes were distributed to the winners.



SWACHHTA PAKHWADA (16.10.2016 – 31.10.2016)

Indian Institute of Crop Processing Technology has been conducting various events and awareness activities to observe Swachhta Pakhwada during 16th – 31st October 2016 with the following activities.

- Cleaned various places and all the roads within the IICPT campus.
- Watering has been done for all the lawns & trees in the campus
- Removed unwanted weeds & trees in the car parking area.
- Converted that land area suitable for tree planting & lawn laying.
- Multi-utility saplings were planted in that area.
- IICPT organized Inter college essay writing competition titled “Health is wealth”
- NSS unit of IICPT organized a procession in Thanjavur town with the Placards showing slogans and quotes about Clean India Mission to create awareness about Clean India program to the public.
- IICPT has organized a workshop on “Cleanliness and waste management in offices” for supporting staffs and housekeeping staffs of IICPT.
- Oath taking for all faculties, staff and students was organised. IICPT family committed to dedicate a particular time every week to work for the cleanliness of the locality by understanding the role of individual efforts in achieving the common goal – Clean India!
- IICPT has organized cleaning activities in all the departments and also hostels.
- IICPT arranged a Food Safety Awareness Campaign for street food vendors. The Chief Guest for the programme was Dr. N. Ramachandran, Hon’ble Vice Chancellor, Periyar Maniammai University, Thanjavur. The Guest of honor Dr. R. Ramesh Babu, Designated Officer, Tamil Nadu Food Safety and Drug Administration, Thanjavur, elucidated the food preservation techniques and methods. The event was presided by Dr. C. Anandharamakrishnan, Director, IICPT who in his address conveyed that respective technologies regarding food production and food safety will be disseminated duly.
- B.Tech students along with staff members visited a modern rice mill in Thanjavur and cleaned the areas within the mill and outside premises along with rice mill staff.



SUMMARY OF RESEARCH FINDINGS



PROJECT TITLE	: Mission onion programme of IIFPT: to double farmers' income
PROJECT TEAM	: Institute Project
PROJECT START AT	: Jun 2016



IIFPT entered into a Memorandum of Understanding with the Perambalur District Onion and Maize Growers Union as a part of the Mission Onion Program in the presence of District Collector, Perambalur, TN

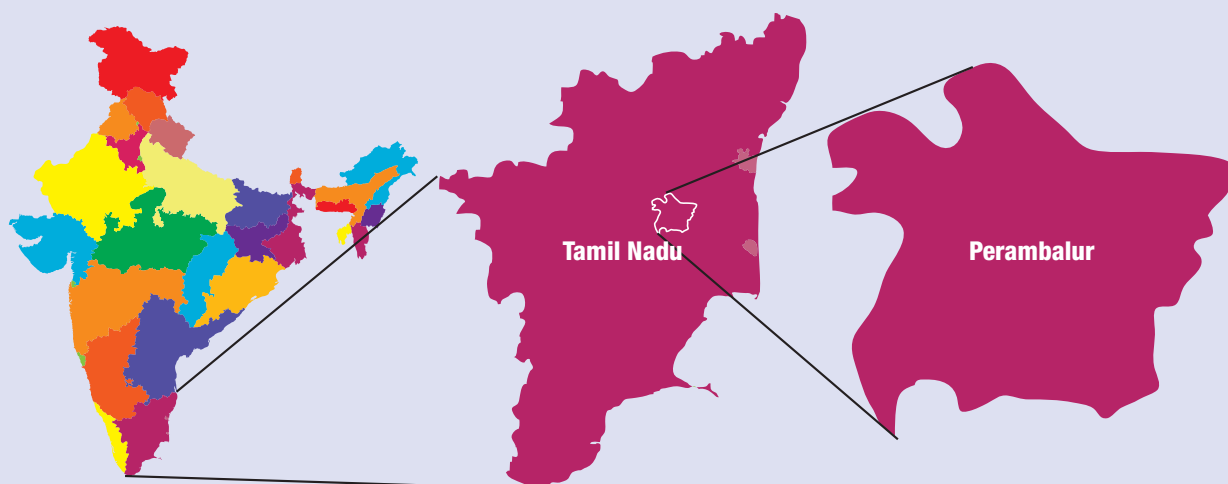
RESEARCH OBJECTIVES

- To develop stem and root cutting machine for small onions
- To develop a peeling machine for small onion
- To develop a modular ventilated structure for onion curing cum storage
- To develop value added products from small onion viz. onion powder, dehydrated flakes, onion paste and vacuum packed fresh peeled onion.
- To select suitable packaging material for the developed products.
- To determine the shelf like and quality (physico-chemical and microbial) of the developed products under ambient and refrigerated storage conditions.

ABOUT THE MISSION ONION PROGRAMME

With an objective to create model food processing incubation centres linking farmers, stakeholders and the State Government, IIFPT is establishing a small onion processing cum incubation centre at Perambalur District, TN under the 'Mission Onion Programme'. This region is the hub for small onions with cultivation in over 8000 hectares producing around 65,000 to 70,000 tonnes every year. Farmers report massive losses due to conventional methods of handling and storage, and lack of schemes for value addition. Based on needs expressed by stakeholders, IIFPT has developed technological solutions to minimize wastage, particularly during seasons with surplus production.

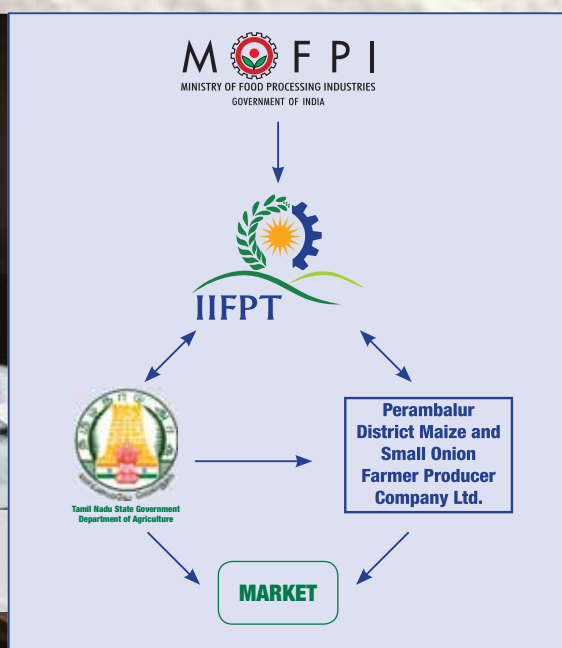
In this regard, with the State Government and District Administration's support of Rs. 115 Lakhs and IIFPT's Rs. 25 Lakhs (through equipment and intellectual property), the model is developed such that once the technology is transferred to the farmer producer union (which is a 1000 farmers cluster with which IIFPT recently entered into a MoU), users will pay user charges to the Institute. Through this concept, farmers' income would be doubled and post-harvest losses of small onion can be curtailed to a great extent. Being a novel concept that has fetched wide reception by the farmer community, the developed unit is classic model incubation centre and similar units can be established in other parts of the country for varied food products.



- Perambalur district is the hub for small onions (Shallots) - cultivation in over 8000 hectares producing around 65,000 to 70,000 tonnes every year
- Farmers reported massive losses due to conventional methods of handling and storage
- Stakeholders from this region expressed their need to provide technological solutions to minimize wastage, particularly during seasons with surplus production
- The farmer producers union which will be involved in this initiative was also launched recently



MoU signed between Indian Institute of Food Processing Technology, Thanjavur and Perambalur District Maize and Small Onion Farmer Producer Company Ltd., Perambalur



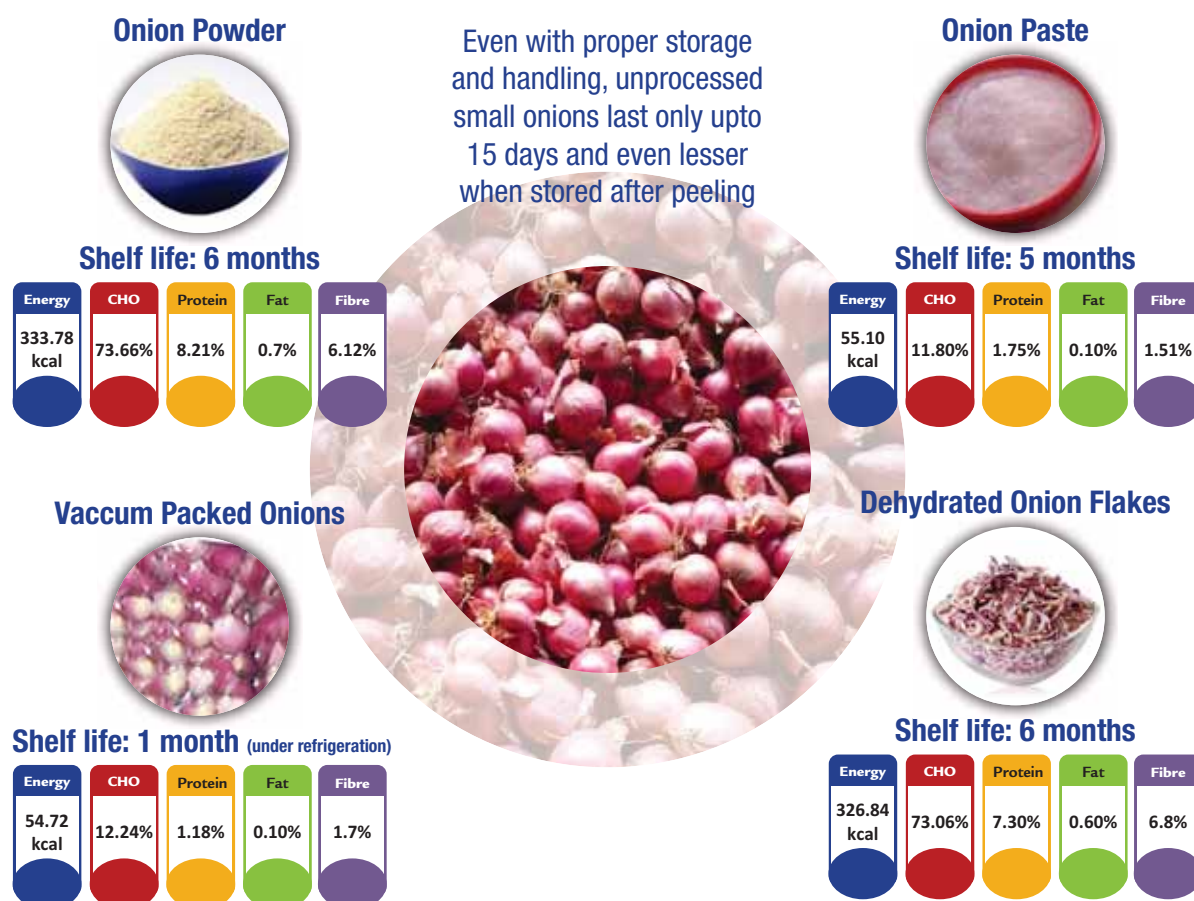
Mission Onion: Establishment of Small Onion Processing cum Incubation Centre at Perambalur District, Tamil Nadu to Double Farmers' Income

IIFPT is establishing a small onion processing cum incubation centre in Chettikulam Village, Perambalur District in collaboration with the State Government of Tamil Nadu



Benefits of Value Addition

- Reduction of storage losses
- Ease of handling
- Shelf life extension
- Increase in income generation
- Wider market coverage for local farmers
- More jobs created



Mission Onion: Machines Developed

Small Onion Stem and Root Cutter



Capacity	200 kg per hour
Cost	₹75,000
Operating Cost	₹70 per hour ; ₹0.35 per kg
Total Energy	0.75 kW

Small Onion Peeler



Capacity	75 kg per hour
Cost	₹1,00,000
Operating Cost	₹85 per hour ; ₹1.50 per kg
Total Energy	4 kW

Solar Assisted Curing cum Storage Unit for Onions



Capacity	600 kg
Cost	₹40,000
Total Energy	150 W

PROJECT TITLE	: Smart warehouses with application of frontier EM & Electronics based technology (S.A.F.E ² .T.Y.)
PROJECT TEAM	: PI : Dr. C. Anandharamakrishnan Co-PI: Dr. S. Shanmugasundaram Dr. R. Mahendran Dr. S. Anandakumar
PROJECT START AT	: Apr 2016

RESEARCH OBJECTIVES:

- Development of electronic vision system (E-Vision) for quality characterization of rice
- Development of moisture content measurement system for paddy using dielectric properties
- Development of suitable sensors for continuous monitoring of temperature and relative humidity in the warehouses
- Design and development of continuous thermal disinfestations system using High Power Radiofrequency systems for ware houses
- Design and development of continuous high power RF system for controlling moisture of paddy before putting it in the warehouses
- Development of ware house management (WMS) system for the paddy storage

RESEARCH FINDINGS:

India is agrarian country and about 70-80% of total food grains produced in India is stored in the ware houses. An estimate concludes that nearly 150 million tons of Paddy is stored in warehouses for 6 months to up to 2 years before they are distributed for public consumption. Due to lack of adequate technologies India loses 10-30% of grains in ware houses due to high moisture, insects, rodents and fungi. This is mainly because of poor management practices in the warehouses. In ware houses, the biotic and abiotic factors determine the quality



Fig. 1. Mortality study of paddy & rice in Radiofrequency & Microwave treatment

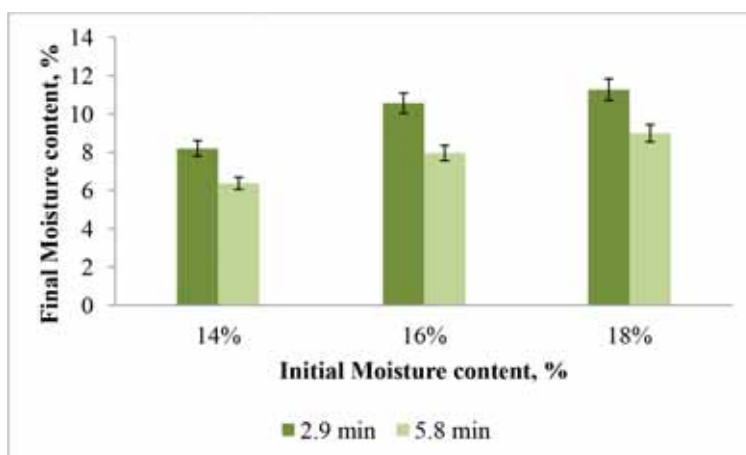


Fig. 2. Effect of RF Treatment on final Moisture content of Paddy at 2.5 kW power level

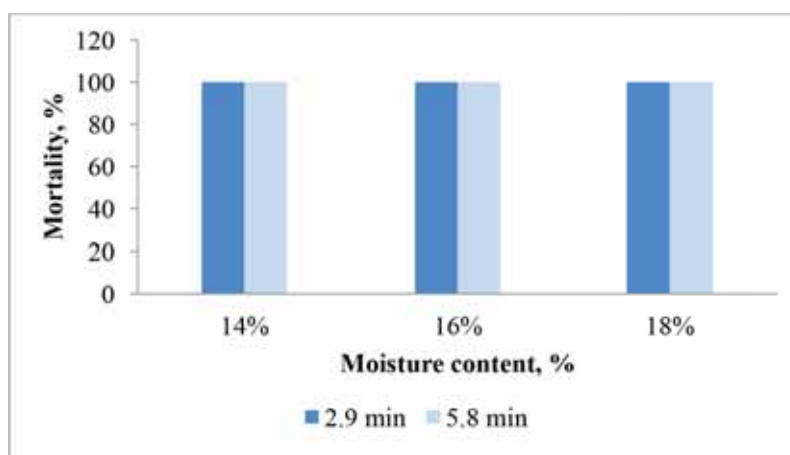


Fig. 3. Effect of RF treatment on insect mortality rate of *Sitophilus oryzae* in paddy at 2.5 kw power level

of the grain stored. Proper controlling the abiotic environment one can safely and easily extend the shelf life of the stored 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 physical, chemical, physiological, biological 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.

Now IIFPT is working for the development of 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.

The preliminary study has been conducted to compare the effect radiofrequency and microwave treatment on insect mortality (*Sitophilus oryzae*) and Moisture controlling for the Paddy and rice. The Radio frequency and Microwave system used for the study is shown in Fig. 1. The results revealed that In RF heating, 100 % mortality achieved at 2.5 kW for both the exposure times 2.9 & 5.8 min where as in microwave heating, 100 % mortality achieved only at 1.5 kW for 20 min exposure time. In rice sample 100% mortality is achieved @2.5 kW for 30 minutes exposure times where as only 80% mortality achieved during microwave treatment@power level 1.5 kW for 20 minutes exposure times. During the Both treatment of Microwave and Radiofrequency the final moisture content reached below 9 % w.b. due to low moisture content of paddy head rice yield was reduced to 45 % and 33 % for Radio frequency and microwave treatment respectively.

The Effect of RF Treatment on final moisture content of paddy and insects mortality at 2.5 kW power level is shown in Fig 2 & Fig 3. It was also observed that higher initial moisture content of sample recorded the higher mortality rate and more moisture loss. It may be due to the high moisture paddy absorbs more energy and the more heat will be generated. Similar results were reported by Vadivambal *et al.*, 2005. Both microwave and Radiofrequency treatment, while increasing the power level and exposure time during the treatment the mortality rate as well as moisture loss in the sample has been increased. This might be due to average temperature

in the sample is increased with an increase in the power level or exposure time or both (Jayas, D.S et al., 2010). Detailed study needs to be conducted for 100 % mortality in sample without much loss in the moisture content.

RESEARCH OUTPUT

- Electronic Vision System (E-Vision) for Quality characterization of Rice
- Moisture content measurement system for paddy using dielectric properties
- Sensors for continuous monitoring of Temperature and Relative Humidity in the warehouses
- RF based Continuous thermal disinfestation and moisture controlling system for ware houses

FUTURE PLANS

- E-vision system has been developed by C-DAC. Now, IIFPT will do the performance evaluation and field trial.
- SAMEER, Mumbai has Developed Microwave based online moisture measurement system. IIFPT will do the performance evaluation and field trial.
- IIFPT will coordinate with SAMMER, Mumbai for the development of RF based Continuous thermal disinfestation and moisture controlling system for ware houses

PROJECT TITLE	: Development of management protocols for on-farm bulk storage of paddy & development of a computer simulation model as design & management tool for bulk storage of grains in India
PROJECT TEAM	: PI: Dr. Kavitha Abirami C.V. Co-PI: Dr. Jeyan Arthur Moses
PROJECT START AT	: Feb 2016

RESEARCH OBJECTIVES

- To study the changes in temperature and moisture content in bulk paddy stored in galvanized iron bins of various capacities as affected by the diurnal and seasonal weather conditions and to draw management protocols for safe on-farm storage of paddy.
- To study the effect of aeration in bringing the temperature and moisture contents uniform throughout the bulk and in maintaining the grain safe during long periods of storage.
- To develop a computer simulation model (which will become an important design and management tool for bulk storage of grains in India) for predicting the temperature and moisture changes with and without aeration in bulk stored paddy and validating the model using the data from objectives 1 and 2.

RESEARCH FINDINGS

In this research, data from the experimental studies conducted in the pilot-scale silo facility at IIFPT will be used to validate a computational model formulated and operated using finite element method. This model will then be used as a tool for development of management protocols for scientific bulk storage under tropical (Indian) conditions. Accordingly, paddy is being stored in three GI bins of capacities 3 T, 5.3 T and 6 T. The H/D ratios of these bins are 0.75, 1.57 and 1.2, respectively. The storage period commenced in August 2016 with paddy being stored at initial moisture content of 12% (w.b.). During the storage period, the following parameters are being monitored: environmental conditions, grain temperature, grain moisture content, colour, milling yield and grain viability. For this purpose, temperature at 3(5), 4(5) and 3(5) grain bed heights in 3, 5.3 and 6 T bins, respectively is being collected for every 2 h interval (values in parenthesis indicate no. of sampling points at individual grain bed heights). Grain parameters are determined using representative samples drawn out from varying locations over 15 days interval each.

Changes in storage temperature during the storage period are presented in Fig. 1. The example presented here is for the studies conducted in the 3 T flat bottom bin. In comparison with ambient temperature, heavy fluctuations were observed in case of grain temperature within the silo. Similar trends for 5.5 and 6 T bins were observed. In all cases, fluctuations up to 25% were noted. Interestingly, temperature of grain in the middle regions was higher as compared to other layers in the bin. This could be attributed to effects of changing temperature patterns outside the bin and higher levels of grain respiration in the region. Other data collected help to understand the effect of diurnal variations and temperature distribution across multiple grain bed heights (2 directions) and across different regions in the same grain bed height.

Changes in grain moisture content during the storage period are presented in Fig. 2. The example presented here is for the studies conducted in the 3 T flat bottom bin. Similar trends for 5.5 and 6 T bins were observed. Regions near the wall showed higher fluctuations owing to more contact with variations in ambient temperatures and associated mass transfer. Other data collected include grain moisture contents of samples from multiple grain bed heights (2 directions).

Changes in grain viability during storage are presented in Fig. 3. The example presented here is for the studies conducted in the 3 T flat bottom bin. Similar trends for 5.5 and 6 T bins were observed. Heavy losses in grain viability/germination capacity were observed after 280 days of storage. Grain that has lost its viability indicates that the grain is dead and is not fit for human consumption. Dead grain does not respire and is more prone to fungal contamination and aflatoxin formation. This study confirmed the dire need for aeration in the bulk storage facility during the storage period.

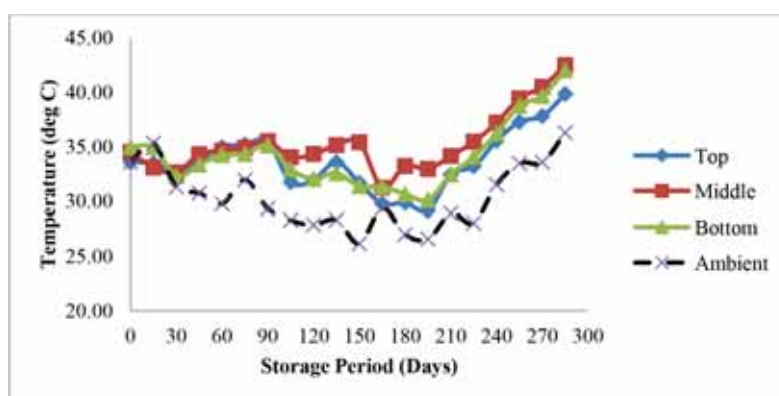


Fig. 1. Changes in storage temperature during the storage period

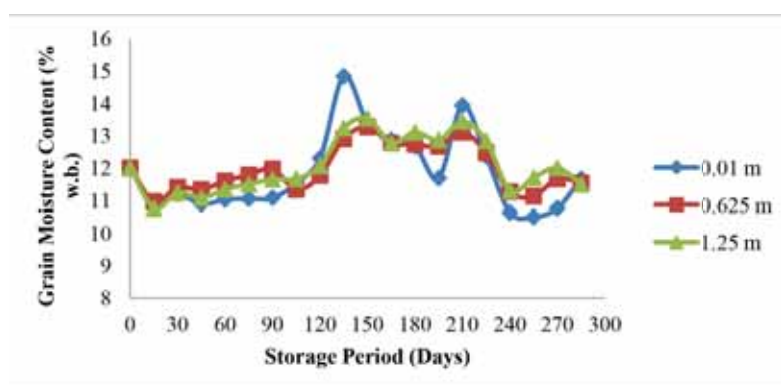


Fig. 2. Changes in grain moisture content during the storage period

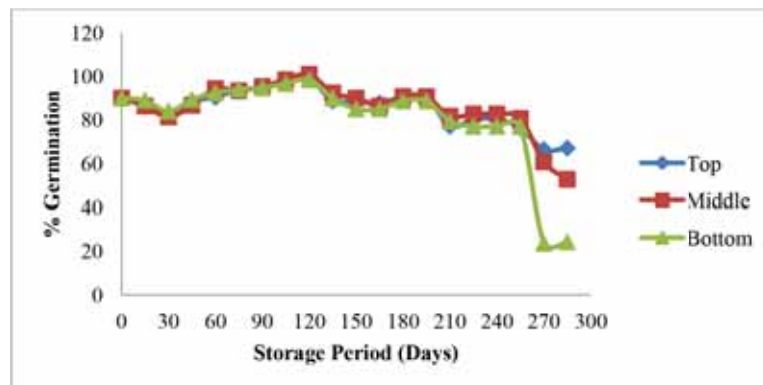


Fig. 3. Changes in grain viability during storage

RESEARCH OUTPUT

- Collected and developed database on temperature and moisture distribution patterns in grain bins for paddy stored under Indian conditions.
- Studies will conclude the feasibility of long-term storage of paddy (and practically other food grains) under Indian conditions in bulk storage systems.
- Developing a 3-D model to work as a powerful tool to develop management protocols for scientific storage and handling (aeration) of food grains under Indian conditions.

FUTURE PLANS

To develop management protocols for scientific storage of food grains in bulk grain storage systems in India. Such scientific guidelines will be very essential to Government and grain handling units across the country as India is now slowly shifting from bag to bulk storage but no such data is available for Indian conditions.

PROJECT TITLE	: Development of an in-bin fumigation system and management protocols for scientific storage of selected Indian spices
PROJECT TEAM	: PI: Dr. Jeyan Arthur Moses Co-PI: Dr. M. Loganathan
PROJECT START AT	: Oct 2016

RESEARCH OBJECTIVES

- To design and develop a pilot-scale in-bin fumigation system for selected Indian spices
- To develop and validate a three-dimensional mathematical model to predict the distribution patterns of fumigant combinations in the developed system
- To conduct long-term storage studies in the developed system with regular monitoring of spice quality

RESEARCH FINDINGS

The most accurate method to determine the fumigant distribution patterns in grain bed is to conduct physical experiments that measure the concentrations at different points. Review on understanding fumigant diffusion patterns in spice bed revealed the following limitations: sorption of fumigant by spice has not been included in most developed model, for simpler computation; several researchers had considered 2D configurations – a concept that does not apply in practical cases, and that there is no work on modeling of fumigant distribution patterns in spice beds till date. The objective of this study was to develop and validate a three-dimensional computational model to predict the diffusion patterns of phosphine through the spice (coriander) bed. Experimental concentrations of phosphine are presented in Fig 1.

To model gas transport through porous medium, a modified form of basic diffusion equations were considered. Properties of coriander seeds were determined and fumigant properties considered for modeling were taken from literature. The sorption and desorption of gas by grain is affected by temperature, moisture content and exposure time. These aspects were considered by interpolating experimental fumigation diffusion kinetics into the model. Fig 2 presents predicted results of PH_3 concentrations in the pilot-scale bin filled with coriander.

Predicted results were in good agreement with experimental values. Relative errors at any point in the bin were not more than 10%. Once the model was validated, four different types of bin geometries were studied as

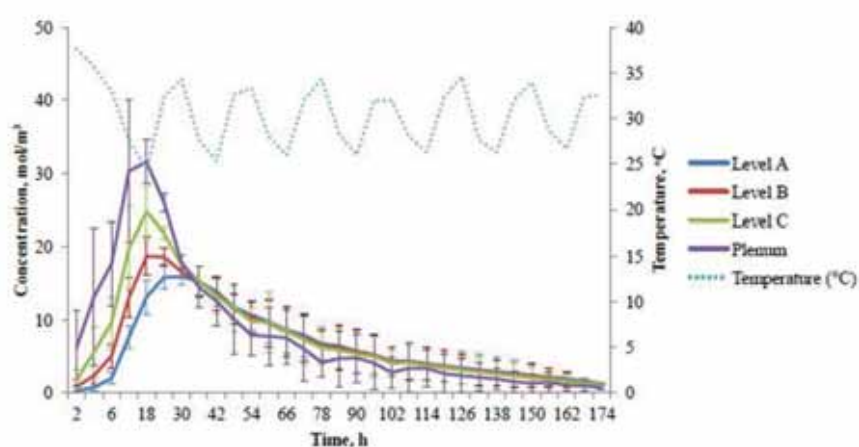


Fig. 1. Average concentration of fumigant at centre point of bin at three different spice bed depths during the study period

Level A (35 cm below the top of bin) has 1-5, Level B (25 cm below the level A) has 1-5 and Level C (25 cm below the level B) has 1-5 concentration measurement points respectively

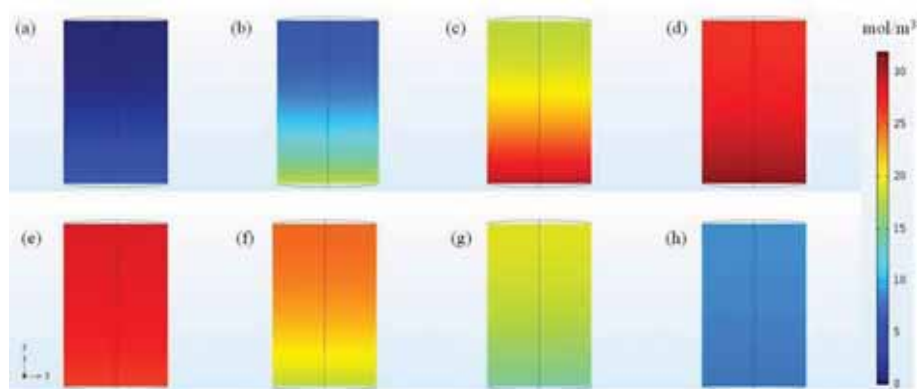


Fig. 2. Simulation results for phosphine diffusion patterns in the pilot-scale bin filled with coriander at different time intervals

a, b, c, d, e, f, g and h represents the time periods such as 1, 6, 12, 18, 24, 30, 36 and 60 hours, respectively

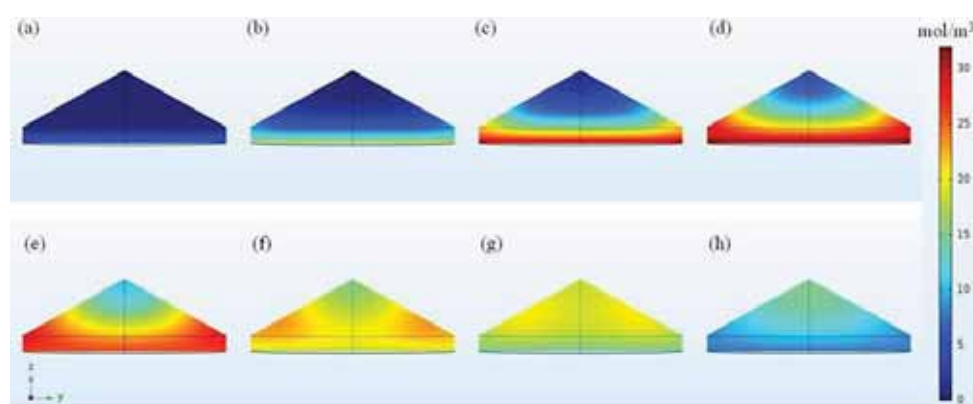


Fig. 3. Simulation results for phosphine diffusion patterns in the bunker filled with coriander at different time intervals

a, b, c, d, e, f, g and h represents the time periods such as 1, 6, 12, 18, 24, 30, 36 and 60 hours, respectively

variables: bunker, flat-bottom bin, hopper-bottom bin and cover and plinth structures. Fig 3 presents simulation results for phosphine diffusion patterns in the bunker filled with coriander at different time intervals. This approach is a quick and reliable means to determine zones in the storage structure that would not get fumigated properly, the dosage requirements and other aspects of scientific fumigation.

RESEARCH OUTPUT

- To eliminate the scope of development of insect resistance due to improper fumigation practices. This also implies eliminating the presence of fumigant residues in Indian spices; unlike in conventional storage systems involving uncontrolled/excessive levels of fumigants
- A computational model to predict fumigant distribution patterns through spice beds has been developed and run using the finite element method. Simulated results were validated against experimental results of fumigant concentrations across different points in a bin.
- The model can also handle variations in bin geometries and also considers the effect of sorption, desorption of fumigant in the spice. The developed model is simple, convenient to handle and requires less computational time apart from giving acceptable accuracy in prediction. The simulation model has the capability to reveal regions of storage bin that does not fumigate properly and prone to insect infestation.
- Insect mortality studies were conducted on *S. paniceum* as affected by phosphine fumigation for three life stages (larvae, pupae and adult)

FUTURE PLANS

- Development of safe storage guidelines for Indian spices

PROJECT TITLE	: Non-destructive quality evaluation of Litchi fruit using E-Vision and E-Nose system
PROJECT TEAM	: PI: Dr. B. K. Yadav Co-PI: Dr. V. R. Sinija
PROJECT START AT	: Apr 2016

RESEARCH OBJECTIVES

- To develop standalone system for Litchi grading/classification based on external appearance and aroma quality parameters using E-vision and E-nose.
- To evaluate the performance of the developed system and develop concept for a continuous type prototype for litchi grading.

RESEARCH FINDINGS

Litchi is a Tropical fruit that is consumed as fresh and can be processed into different products. Though India is second largest producer of the litchi fruit its share in global export scenario is very less due to short shelf-life. There is need to pack only sorted sound fruit to have longer shelf-life in various packaged conditions. Taking this need into consideration, current study is undertaken to develop a continuous type of grader for grading Litchi fruit based on FVGMR (2004) and AGMARK criteria using E-Nose and E-Vision hybrid system.

For development of E-Nose module and selection of the sensors the volatile aromatic compounds in the litchi fruits of different grades viz. Cracked, Borer infected, fungal infected, sun burn and good samples (images shown in Fig. 1) were analyzed using GC-MS. The major differentiating volatile compounds among various categories of defected and good litchi fruit are shown in Table 1. The compounds specially present in different grades such as 15-Tetracosenoic acid, methyl ester, (Z)- for control, Ethyl 13-docosenoate(ethyl erucate) for cracked, 2,4-dimethyl-Hexane for fungal infected, 9,12-Octadecadienoic acid(Z,Z)- for borer infected and 2,2-dimethyl-1-(4-phenoxy-phenyl)-1-Propanone for sun burn sample can be utilized for non-destructive way of differentiating respective class of fruit using E-Nose system. Further work is continuing to select proper sensors for E-Nose system. The same grades of fruits were imaged and algorithms are being developed for grading them. The schematic diagram of the continuous conveyerised litchi sorting machine is being finalized.

RESEARCH OUTPUT

- Volatile compounds were analyzed for different grades of the litchi fruit.
- The sensor selection is being done for differentiating good and defective litchi fruits (Fig. 1) using above information.

FUTURE PLANS

- Development of E-Nose module and combined with E-Vision system to come up with a hybrid system for grading of litchi
- Fabrication of the prototype and their testing.



Fig. 1. Different grades of litchi fruit

TABLE 1. MAJOR DIFFERENTIATING VOLATILE COMPOUNDS AMONG VARIOUS CATEGORIES OF DEFECTED AND GOOD LITCHI FRUIT

Sample		Name of Compounds	Molecular Formulae	Area Under Peak (%)
Control (Good)	1	4,4'-Ethylenebis(2,6-di-tert-butylphenol)	$C_{30}H_{46}O_2$	5.90
	2	Tetracosanoic acid, methyl ester	$C_{25}H_{50}O_2$	4.60
Crack	1	Ethyl 13-docosenoate(ethyl erucate)	$C_{24}H_{46}O_2$	14.89
	2	Eruic acid	$C_{22}H_{42}O_2$	12.46
Fungal Infected	1	Hexane, 2,4-dimethyl-	C_8H_{18}	4.99
	2	Cis-Vaccenic acid	$C_{18}H_{34}O_2$	0.73
Borer Infected	1	9,12-Octadecadienoic acid(Z,Z)-	$C_{18}H_{32}O_2$	46.44
	2	Butylated Hydroxytoluene	$C_{15}H_{24}O$	31.72
Sun Burn	1	9-Octadecadienoic acid(Z)- 2-hydroxy-1-(Hydroxymethyl)ethyl ester	$C_{21}H_{40}O_4$	2.95
	2	1-Propanone, 2,2-dimethyl-1-(4-phenoxyphenyl)-	$C_{17}H_{18}O_2$	2.44

PROJECT TITLE	: Design and development of MW dryer/roaster for farm produce
PROJECT TEAM	: PI: Dr. N. Venkatachalapathy
PROJECT START AT	: May 2017

RESEARCH OBJECTIVES

- To design a continuous microwave dryer with variable power range to reduce the moisture content of farm produce.
- To evaluate the machine with various products with different moisture level with respect to time duration and microwave power level.
- To test the performance of the equipment for roasting of selected food products.

RESEARCH FINDINGS

For construction of prototype, specifications of the components namely (microwave generation and its accessories) magnetron, wave guides, applicator, cooling systems, blower motor, temperature measuring digital temperature meter, thermocouple, limit switches were collected. Also, specification for microwave power measuring meter and attenuator details were finalized. Magnetrons are available with frequency of 915 MHz, 2450 MHz and 5800 MHz and power range from 100W to 10 kW. As the frequency of microwaves increases, wave length decreases hence a 2450 MHz frequency is suitable for the power rating ranging from 1 kW to 20 kW. For 12 kW power dryer, six 2 kW air cooling based magnetron is selected. The constructional diagram of 2 kW magnetron is shown in Fig. 1.

Wave guide is playing vital role in microwave transmission. The WR340LAUNB wave guide is designed as a precision low cost device and is suitable to transmit the generated microwaves by 2 kW air cooling based magnetron. The unit is made of stainless steel which results in an attractive package resistant to corrosion and harsh environments (Fig. 2).

Power and cooling requirements are critical considerations in magnetron operation, and the two are inextricably intertwined. The air flow fan has been chosen for cooling the selected magnetron. Capable to run with single phase 230 V & 50 Hz, power rating of 50 W and a speed of 2600 rpm (Fig. 3).

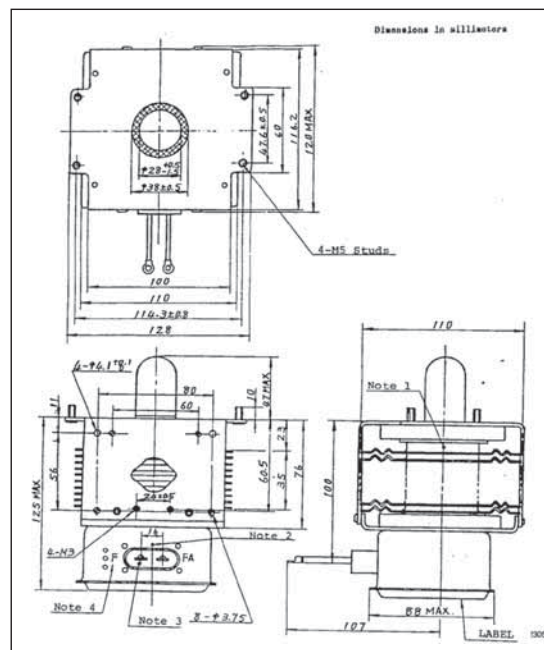


Fig. 1. Constructional diagram of 2 kW magnetron

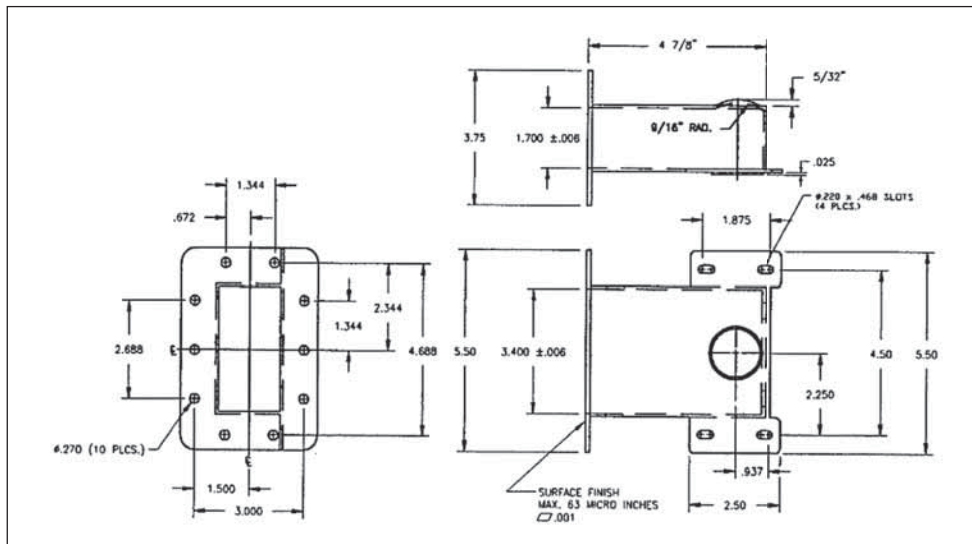


Fig. 2. Constructional diagram of waveguide

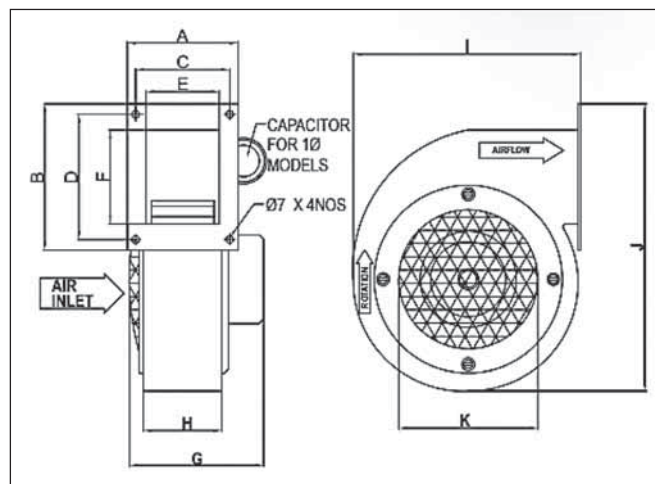


Fig. 3. Constructional diagram of cooling fan

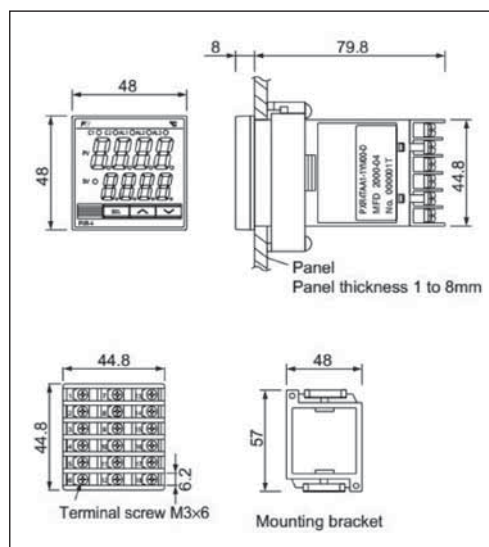


Fig. 4. Constructional diagram of PXR4 meter

Temperature measurement is vital for detecting the temperature of product. PXR4 digital temperature meter is selected which can be used with any type of thermocouples (Fig 4).

RESEARCH OUTPUT

- Different components of the microwave system has been identified for fabrication of the dryer.

FUTURE PLANS

- To design a continuous microwave dryer with variable power range to reduce the moisture content of farm produce.
- To build a simulation model of microwave heating.
- To evaluate the machine with various products with different moisture level with respect to time duration and microwave power level.
- To test the performance the equipment for roasting of selected food products.

PROJECT TITLE	: Design and development of atmospheric pressure non-thermal plasma system for food processing application
PROJECT TEAM	: PI: Dr. R. Mahendran
PROJECT START AT	: Feb 2016

RESEARCH OBJECTIVES

- To design and develop Atmospheric Pressure Non-Thermal Plasma (APNTP) system suitable for sterilizing food products.
- To study the effect of plasma on the surface sterilization of bread loafs and study the storage characteristics of the plasma treated bread loafs.

RESEARCH FINDINGS

Plasma is a neutralized gas that comprises of highly reactive species including, positive ions, negative ions, free radicals, electrons and photons at or near room temperature. NTP is an emerging non-thermal food processing technology with potential application for sterilization in food industries. This research work focuses on designing and development of lab model NTP system and studying the effect of NTP on surface sterilization of bread slices.

Initially bench scale plasma systems were developed and tried for food applications sequentially. The experiences gained from these designs and by rectifying the defects identified in these initial models, a more robust and useful laboratory scale NTP system was designed and developed. Packed bread slices were exposed to plasma at different voltages, various electrode distances and exposure times as per Central Composite Design (CCD) combinations by Design Expert software. The treated bread slices were stored in an incubator at $32 \pm 2^\circ\text{C}$. The stored bread slices were observed regularly at a time interval of 6 hr and were declared spoiled when visible mold growth was observed and the storage studies were stopped. Untreated bread slices from the same loaf of bread were used as controls.

Statistical analysis of responses such as, texture firmness, color and visible mold revealed a second order polynomial equation for each response and are fitted significantly with the experimental data at 5% level of significance. The predicted optimized conditions (distance between electrodes: 4 cm, voltage 2585 and exposure time varied from 30 to 150 sec with steps of 30 sec), an experiment was performed and it was found that treatment of 30 sec reduced the initial population from 8 to 7 \log_{10} CFUg⁻¹. Further increasing the NTP exposure time from 30 to 60 sec and 60 to 90 sec, reduced the bread mold populations to 5 and 1 \log_{10} CFUg⁻¹ respectively (Fig. 1). Populations of bread mold were still reduced to levels below deduction limits after extended NTP exposure time for 120 and 150 sec.

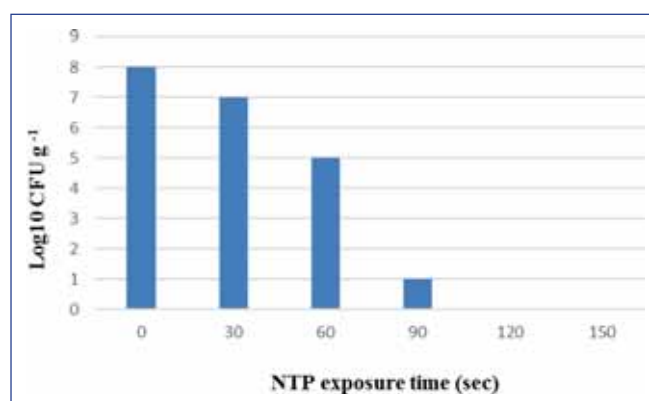


Fig. 1. NTP inactivation efficacy against bread mold inoculated on bread slices

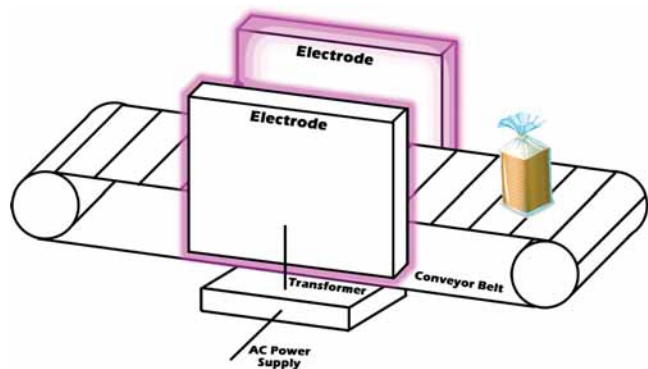


Fig. 2. Line diagram of developed APNTP system



Fig. 3. Continuous system under development

Based on the above study, continuous non-thermal plasma system is being developed (Fig. 2 and 3), it consists of conveyor with plasma zone, planer electrodes, power source and dielectric barrier material. The food sample placed on the conveyor will move between the electrodes and plasma would be generated. In this research work, potential application of plasma on surface sterilization of bread loaf is being studied.

RESEARCH OUTPUT

An indigenous Atmospheric Pressure Non-Thermal Plasma (APNTP) system suitable for sterilizing food products.

FUTURE PLANS

Creating a centre of excellence in cold plasma laboratory in IIFPT.

PROJECT TITLE	: Solar energy assisted on-farm thresher cum winnower processing gadgets for millets farmers
PROJECT TEAM	: PI: Dr. S. Shanmugasundaram
PROJECT START AT	: Jan 2016

RESEARCH OBJECTIVES

- Development of on farm solar energy assisted bulk drying system for millet heads
- Development of combined thresher cum winnower for millet heads

RESEARCH FINDINGS

Millets are very important food crop and harvesting of many varieties of millets is done by removing the individual heads with sickles or small hand knives. At the time of harvest millet heads moisture contents in the range of 18 to 24 percent. Drying for two to three days is a pre-requisite for easy grain separation during threshing, but many times it may not be achieved due to weather conditions. During the threshing operation, Damage to the grains is usually related to moisture content at harvest; the lower the moisture content, the less the damage. The millet heads must dried to moisture levels of about 12 percent. Development of appropriate on farm drying system for millet heads is essential. Also, Threshing is the removal of millet from millet head. Threshing of millet is done manually by women and men in India. It entails beating the millet heads with sticks or clubs repeatedly until almost all the grains are detached from the heads. The beating action may be done either on a mat, canvas or bare ground. Threshing on roads leads to grain damage and loss. Threshing and drying on mud floor is also less efficient. Small stones, dirt and other varieties get mixed with the grains during threshing and drying operation, thereby leading to loss in quality.

Preliminary drying studies has been conducted for freshly harvested finger millet (*Eleusine coracaona*) panicles in open sun drying, solar tunnel drying and cabinet dryer drying using response surface methodology (RSM), where the process variable were drying temperature(45-65°C), drying time(0-960minutes), sample thickness (300-500 mm). It was observed that the process variables drying time, drying temperature and sample thickness had significant effect on the open sun and solar tunnel drying. There was no significant effect of sample thickness during cabinet drying. There was significant effect on the physico mechanical properties of the millets during open sun drying but not during solar tunnel and cabinet drying. A central composite design (CCD) was used to optimize the process condition. The optimum drying time during cabinet drying was 350 minutes at a drying

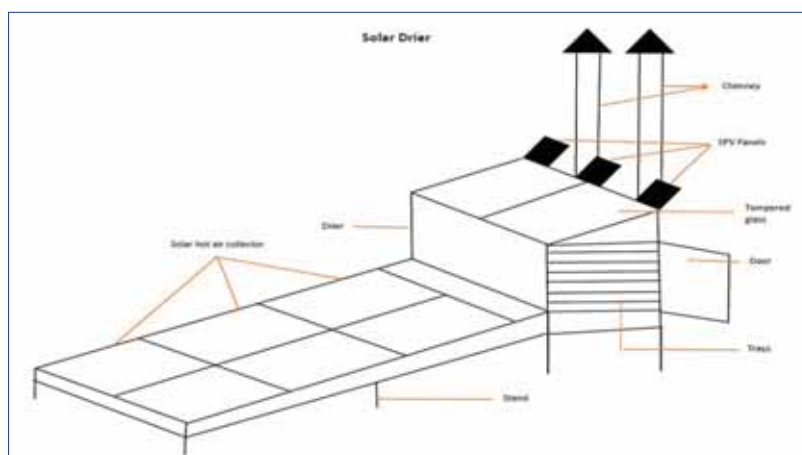


Fig. 1. Conceptual Design of Solar Assisted Dryer

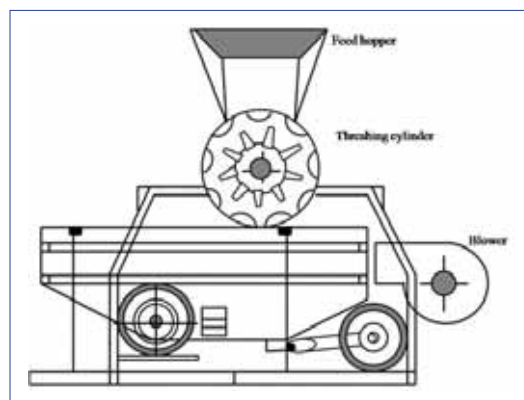


Fig. 2. Conceptual Design of Combined thresher cum winnower for millet heads

temperature of 62°C and sample thickness of 400mm to reduce the moisture content of the Finger millet panicle to 8.35% (d.b.) whereas during open sun drying was 24 hours sample thickness of 400mm to reduce the moisture content of the Finger millet panicles to 8.35% (d.b.). Also, the optimum drying time during solar tunnel drying was 960 minutes at a drying temperature of 55°C and sample thickness of 400mm to reduce the moisture content of the millets to 8.35% (d.b.). Based on the drying characteristics and threshing study conceptual design has been made for the solar assisted dryer & Millet thresher cum winnower and given as Fig. 1 & Fig. 2.

RESEARCH OUTPUT

- Studies on drying characteristics of freshly harvested finger millet (*Eleusine coracona*) panicles with different drying methods
- Design has been made for the solar assisted dryer & Millet thresher

FUTURE PLANS

- Performance evaluation solar assisted dryer
- Fabrication and testing of thresher for millets

PROJECT TITLE	: Nanopatterning with low temperature process for the production of instant foaming soluble coffee
PROJECT TEAM	: PI: Dr. C. Anandharamakrishnan
PROJECT START AT	: Jun 2015

RESEARCH OBJECTIVES

- Development of methodology for the stabilization of microbubbles in foamed coffee extract by the self-assembly based nanopatterning technique.
- Development of spray-freeze-drying process for the drying of foamed coffee extract.
- Characterization of nanopatterned microbubbles in the foamed coffee extract and the aroma profile of the dried soluble coffee powder.

RESEARCH FINDINGS

This work aims at production of instant coffee of standard aroma quality by integrating the two approaches, i.e. nanopatterning and spray-freeze-drying (SFD, a low temperature process) to obtain the synergistic advantages. One of the key goals of this project is the development of an integrated system for high pressure foaming and spray-freeze-drying of coffee extract for the production of instant coffee powder. With this system and the methodology standardized in this work, the total processing time is expected to be shortened for the production of soluble coffee with premium aroma quality, in comparison to the conventionally employed freeze drying process.

As a prelude to the approved objectives of this proposal, four milestones were envisaged and executed during the first year of the project period. Accordingly, the accomplished deliverables during the work period include optimization of feed and process parameters for establishing spray-freeze-drying as a technique for the production of soluble coffee powder, in terms of the product microstructure and volatile profile; design and fabrication of an integrated system for the high pressure foaming and spray-freeze-drying and standardization of methodology for processing the coffee extract using the developed system; an approach has been developed and standardized to study the transient characteristics, foamability, foam stability and bubble size distribution of coffee foam using the Dynamic Foam Analyzer equipment as a function of three parameters namely, total coffee solids (%), gas flow rate (L/min) and foaming time (s).

The developed integrated spray freeze drying system (Fig. 1) includes a semi-automated arrangement for the spray-freezing process which employs a pneumatic set-up for the adjustment of the level of product container from the nozzle orifice, an impeller-arrangement for the mixing of atomized feed composition to prevent its agglomeration within the cryogen in the product container and a nozzle heater. Display system is available for the monitoring and adjustment of product temperature and impeller speed, respectively. The system includes appropriate space for housing the pressure vessel, freeze-drier and cryogenic container.

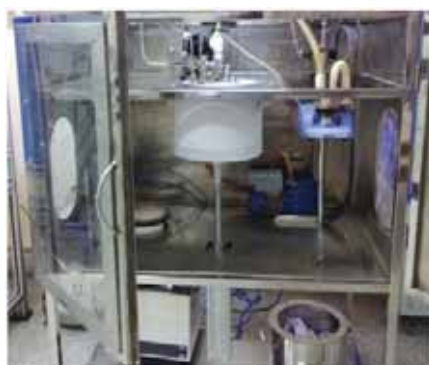


Fig. 1. Fabricated system for integrated high pressure foaming and spray-freezing operations

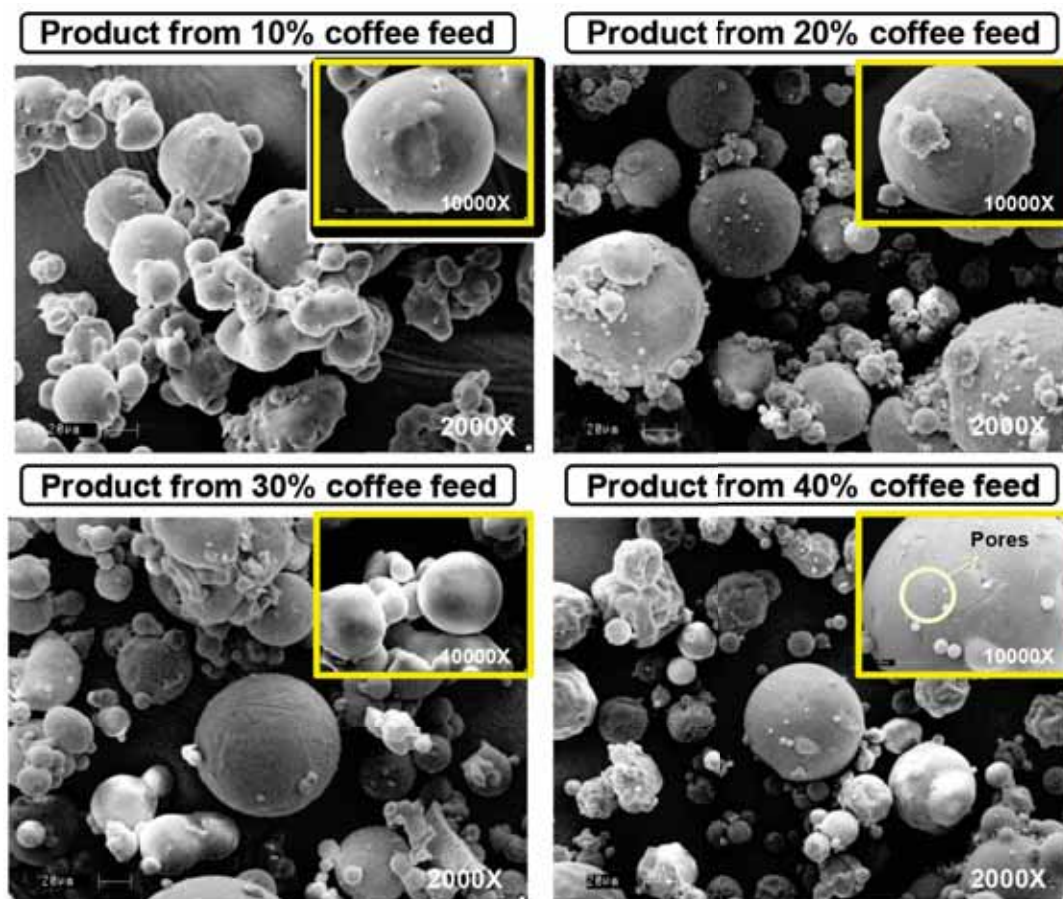


Fig. 2. SEM micrographs of spray-freeze-dried coffee powder from different feed concentrations

The product developed using this system depicted voids in its microstructure thus confirming the internalization of nitrogen gas used for the gasification of coffee feed solution. The optimization studies on SFD showed that the 40% coffee feed resulted in porous microstructure as revealed by the scanning electron microscopy (Fig. 2) and superior aroma quality demonstrated by the retention of the lowest boiling character impact coffee of roasted coffee brew, acetaldehyde (20°C) (Fig. 3).

Optimization of foamability and foam structural stability in foamed coffee extract:

For all measurements of foamability, foam stability and foam structure, the dynamic foam analyzer, DFA100, manufactured by KRÜSS, Germany was used by employing the foam structure module comprising of a glass column with prism, a camera and LED illumination. Foam height and foam structure were measured simultaneously. For foaming, the method of air sparging was used by bubbling the air through a ceramic filter plate of 50 mm diameter and pore size 100-160 μm , fixed at the bottom of glass column containing the coffee samples. Sample size was 40 mL for all the measurements. The foam structure is recorded by the instrument based on the principle of total reflection by which the prism generates images of the 2-dimensional foam structure with very high contrast. The resultant images were analyzed by the Foam Analysis Software and the bubble size was recorded at every time step, over a time period of 30 minutes (1800 s). For all measurements, the bubble structure was observed at 70 mm above the frit of the glass column mounted with prism. The evolution of microbubbles in coffee foam observed with different trials is presented in (Fig. 4). Influence of total solids and foaming time on maximum foam volume at constant gas flow rate is presented in (Fig. 5). Further the stability studies of microbubbles reveals the higher rate of coarsening of the BSD lead to lower stability of microbubbles in coffee foam. Converging bubble size distribution, indicated by the reduction in width of BSD represents the destabilization due to Ostwald ripening which leads to the lowest stability of microbubbles.

For the first time, coffee based foam has been characterized for its foamability, foam stability and size of microbubbles. The study revealed that a higher foamability is achieved at the lowest coffee solid content, medium gas flow rate and longer foaming time, which instigates further interest for future investigation.

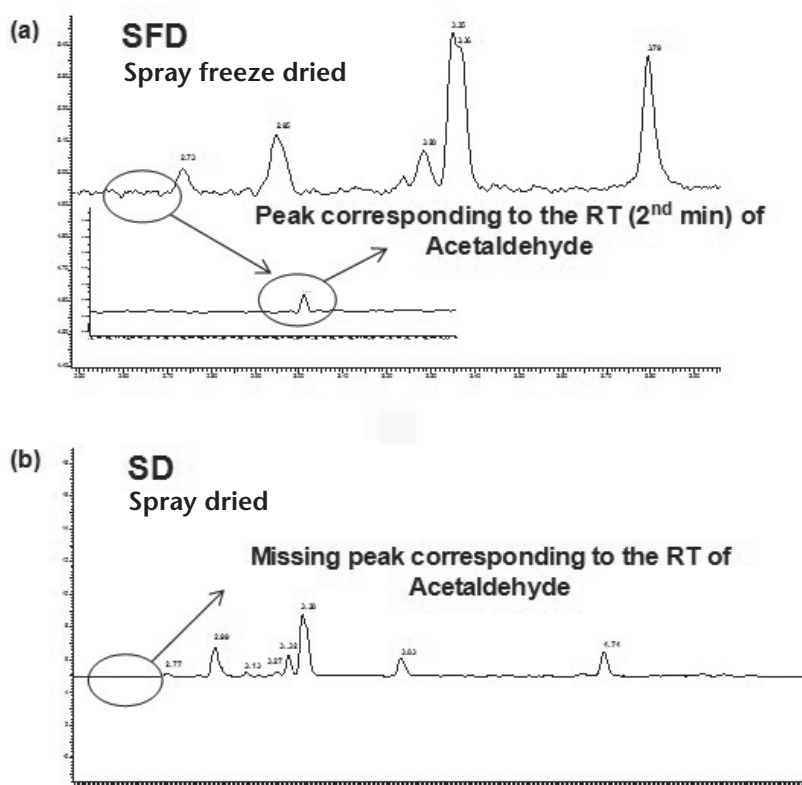


Fig. 3. Volatile profiles of (a) SFD and (b) SD coffee powders, using GC analysis

Trial Details	0 th min	5 th min	10 th min	15 th min	20 th min	25 th min	30 th min
TS: 20% GFR: 0.3 L/min FT: 40 s							
TS: 20% GFR: 0.5 L/min FT: 27.79 s							
TS: 30% GFR: 0.3 L/min FT: 35 s							
TS: 40% GFR: 0.4 L/min FT: 30 s							

Fig. 4. Structural kinetics of coffee foam: Evolution of microbubbles with time

RESEARCH OUTPUT

- A soluble coffee product with improved volatile retention.
- Design and development of unique and semi-automated equipment for the spray-freezing of liquid feed compositions, with precise controls and display of all the relevant operational parameters.
- Developed spray-freezing equipment can be used for any liquid feed composition comprising of any food bioactive compound, for improved physicochemical stability.

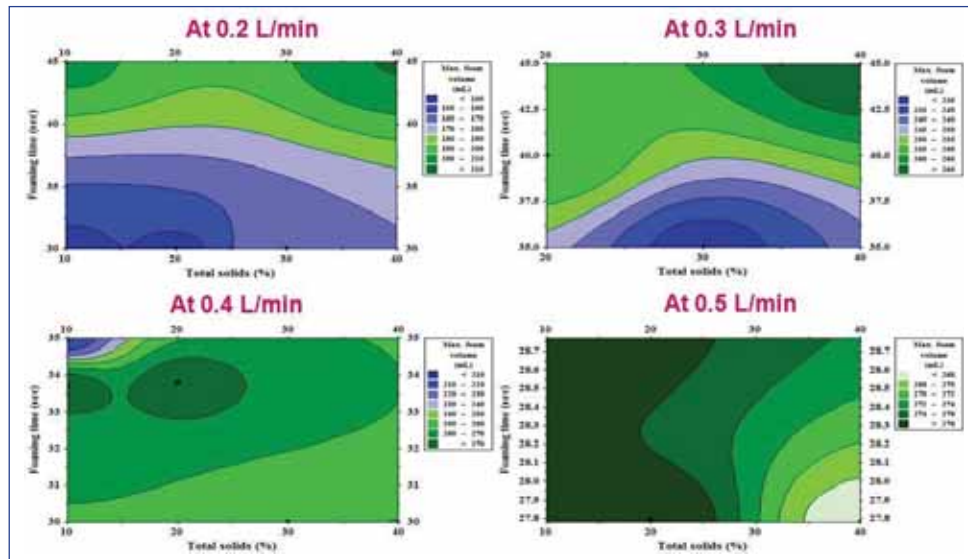


Fig. 5. Influence of TS and FT on maximum foam volume at constant GFR

- Development of self-assembly based nanopatterning technique for stabilization of microbubbles in foamed coffee extract
- Detailed study on the dynamics of coffee foam structure and stability with the dynamic foam analyzer equipment. (First of its kind)

FUTURE PLANS

From the present observations, the hypothesis for future study is that with the gasification and nanopatterning, stable foam may be achieved at lower coffee solid content in the extract which leads to product with enhanced aroma properties.

PROJECT TITLE	: Design and development of engineered nano food particles
PROJECT TEAM	: PI: Dr. C. Anandharamakrishnan
PROJECT START AT	: Jul 2014

RESEARCH OBJECTIVES

- Development of an integrated electro-spraying and Freezing-drying system to produce stable nanocapsules of bioactive compounds (Eg Curcumin and β -carotene)
- To optimize the electro-spray technique by altering the parameters like conductivity viscosity surface tension and density of the electro-spray feed solution
- Development of 3-D computational model to simulate the nano droplet dynamics Electricfield, charge distribution, force distribution etc.
- Characterization of physicochemical and structural properties of nanoencapsulated bioactive compounds (E.g curcumin and β -carotene).

RESEARCH FINDINGS

Development of integrated electro-spray freeze-drying system:

A pilot scale integrated electro-spray-freeze-drying system has been designed and fabricated (Fig. 1). This system allows handling of greater quantity of feed solution which leads to a significant improvement in the throughput of nanoparticles production, substantial reduction in the processing time and a considerable advancement in enhancing the industrial scale operability of electro-spray-freeze-drying process. The equipment enables controlled flow of the cryogenic liquid into the product collection trays along with a vacuum tight seal for the whole electro-spray-freeze-drying chamber. This permits regulated use of the cryogenic liquid for the rapid freezing operation besides preventing its loss due to evaporation during the process. The freeze-drying operation results in a porous structure of the nanoparticles which is beneficial in terms of obtaining better solubility and bioavailability of the food bioactive compounds. Also, since there is no need for intermediate transfer of particles for the ensuring freeze-drying operation, production of dried and porous nanoparticles can be rendered continuous. The system can be utilized for the processing of water-based formulations of relevance in food system.



Fig. 1. Integrated electro-spray freeze drying system-(pilot scale facility for nano-particles production)

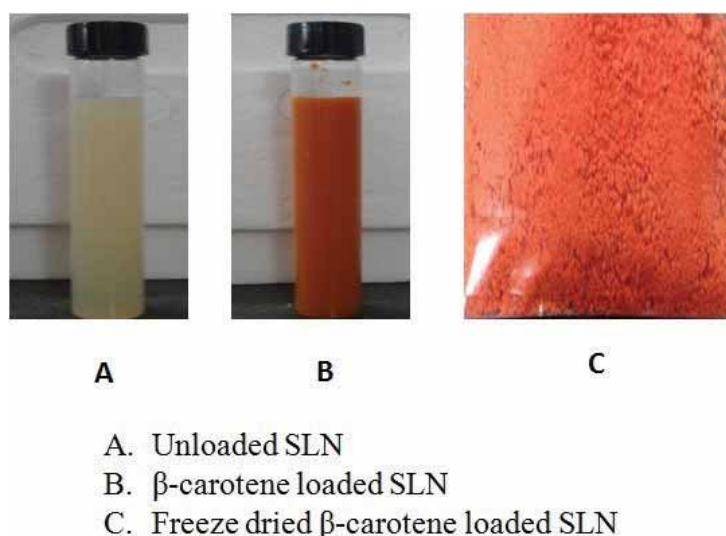


Fig. 2. Unloaded SLN; B – β -carotene loaded SLN; C – freeze dried SLN

Nanoencapsulation of Curcumin:

Curcumin the most active and least stable bioactive component of turmeric, was encapsulated in coconut oil droplets of nanoemulsion prepared by homogenization using whey protein concentrate-80 (WPC-80) and Tween-80 as emulsifiers. Oil-in-Water nanoemulsion is prepared in two stages. Curcumin (40 mg) was added to 20 ml of total emulsion along with coconut oil (10 %) surfactant Tween-80 (10 %) and WPC-80 (10 %) in distilled water. In the step the coarse emulsion was prepared using magnetic stirrer at ambient temperature for 10 min. In the second step, fine emulsion was prepared by homogenization at 15000 rpm for 5 min using Ultra Turax homogenizer. This emulsion is electrosprayed at a constant flow rate of 0.3 ml/h with a voltage of 16 kV at a distance of 8 cm between the needle tip and collector. The process was carried out at ambient conditions and the dried nanocapsule collected on aluminium foil. Powdered curcumin loaded nanoparticles were obtained. Further physico chemical, morphological and in-vitro studies to be carried out to characterize the synthesized particles.

β -Carotene Loaded Solid Lipid Nanoparticles (SLN):

β -carotene has been encapsulated in lipid based wall materials (Glycerol monostearate (GMS) and Stearic Acid (SA)) and stabilized with surfactant (Soy lecithin) and co-surfactant (tween 80). Nanoencapsulation of β -carotene in the lipid wall material was obtained using high energy techniques of high shear homogenization followed by ultrasonication. The resulted nanoemulsion of encapsulated β -carotene was freeze dried to obtain the Solid Lipid Nanoparticles (SLN) with β -carotene encapsulated in it (Fig. 2). β -carotene loaded SLN was characterized for its physical, chemical properties and stability. The particle size of solid lipid nanoparticles (SLN) before and after freeze-drying was 44 ± 19 nm and 72 ± 5.55 nm respectively. The zeta potential of β -carotene loaded SLN was -25.5 mV, indicating the stability of nanoparticles after freeze drying. Freeze dried SLN showed excellent storage stability in terms of color, powder flow properties, rehydration time and moisture content.

SLN showed sustained release of β -carotene for 20 h under *in vitro* condition. Also, upon simulated gastrointestinal conditions, SLN showed greater physical stability with better retention in particle size of 137.5 nm during gastric digestion and 446.9 nm during intestinal digestion. This result suggests that SLN bypasses stomach digestion and its components were prone to the enzyme complex present inside small intestine, thus increasing its bioavailability. Similarly, the antioxidant activity of nanoencapsulated β -carotene showed similar results when compared to unencapsulated β -carotene during DPPH and FRAP assay. After incorporating into food system (bread), nanoencapsulated β -carotene inside lipid matrix retained higher stability ($33.54 \mu\text{g/g}$) than unencapsulated β -carotene ($3.86 \mu\text{g/g}$). Results suggest that SLN is promising delivery system for food bioactive compounds.

RESEARCH OUTPUT

- Integrated electrospray- freeze drying system for production of porous nanoparticles
- Nanoencapsulation of bioactive molecules (curcumin and β -Carotene) using integrated electrospray- freeze drying technique and their characterization

- Development of technique for production of stable dried nanoparticles of food bioactive compounds from aqueous feed formulations
- Development of efficient delivery system for sensitive food bioactive compounds of both hydrophilic and hydrophobic nature
- Computational fluid dynamic (CFD) model for predicting droplet dynamics of electro spraying system

FUTURE PLANS

- Development of computational fluid dynamics (CFD) model for predicting droplet dynamics and experimental validation of predicted model.
- Optimization of operating parameters in the integrated electro spray-freeze drying system (feed flow rate, position of electrodes, electric potential, cold nitrogen gas flow rate, temperature and velocity)
- Nanoencapsulation of curcumin and β -carotene using integrated electro spray-freeze drying technique and their characterization.
- To evaluate the efficiency using everted gut system.

PROJECT TITLE	: Identification of sustainable technologies for value chain development of Jackfruit
PROJECT TEAM	: PI: Dr. R. Jaganmohan Co-PI 1: Dr. Ashish Rawson Co-PI 2: Er. Sandeep Janghu
PROJECT START AT	: Jan 2016

RESEARCH OBJECTIVES

- To design and develop gadgets for on-farm and industrial level pre-processing of freshly harvested Jack fruit
- To develop protocols and technologies for extending the shelf life of preprocessed and processed Jack fruit and its value addition
- To extract and identify nutraceuticals components from seed and fruit byproduct
- Commercialization of the developed gadgets and jackfruit products to the market

RESEARCH FINDINGS

In the present study, a jackfruit peeling machine was developed (Fig. 1). After determination of physical and textural properties of the jackfruit, various sections of the jackfruit peeler were designed. The system consisted of a central penetrating shaft, handle, blade and table. The efficiency of the machine was found out for both coring and peeling operations. Peeling efficiency varied with the type of blade used and was found to be 7%, 20% and 61% for type 1, type 2 and type 3 blades respectively.

Another aspect of the study was to analyze the chemical composition of all parts of jackfruit (i.e. bulb, strand, seed, rind and core). The idea was to incorporate different parts of jackfruit rich in dietary fibre to Indian flat bread. Proximate analysis of different parts of jackfruit in the present study showed that jackfruit is rich in fibre content (highest in core part, 32%) and a good source of protein (highest in seed part, 15%). Proximate composition and functional properties of various part of jackfruit showed a good scope of utilization of the byproducts from jackfruit for healthy food product development. The effect of incorporation of jackfruit flour in flat bread was examined by the product quality attributes. Jackfruit flour and wheat flour were added at levels of : fruit 0-30%, strand 0-10%, seed 0-10%, rind 0-10%, rind 0-10% and wheat 50-100% for the flat bread flour formulation. D-optimal mixture design was used for the optimization. It was found that the dough springiness, flat bread



Fig. 1. Jackfruit coring and peeling machine

color, flat bread overall acceptability and shear force varied significantly with respect to the incorporation of flour of jackfruit different parts in wheat for the preparation of flat bread. The results suggest that the substitution of the jackfruit flour for flat bread preparation is acceptable and highly nutritious and a prospective health benefit for people suffering from diabetes and obesity.

The antioxidant activity of different parts of the jack fruits were compared with ascorbic acid as standard. It was found that strand regions had higher (6.4 mg/g) total flavonoid contents followed by the core. The seed part had the least flavinod content (2.4 mg/g). Similar trend was observed in DPPH(1,1-Diphenyl-2-picrylhydrazyl) activity with different parts of jackfruit.

RESEARCH OUTPUT

- Coring and peeling machine for jackfruit
- Value added nutraceutical products from jackfruit

FUTURE PLANS

- To extract and identify nutraceuticals components from seed and fruit byproduct.
- Commercialization of the developed gadgets and jackfruit products to the market.

PROJECT TITLE	: Microwave assisted extraction of soymilk for improving its functionality
PROJECT TEAM	: PI: Dr. Akash Pare
PROJECT START AT	: Feb 2016

RESEARCH OBJECTIVES

- To add microwave heating arrangement in soymilk plant for improving soy milk characteristics.
- To determine the impact of microwave heating on quality and functional properties of soymilk and milk products.
- Optimization of process parameters of microwave heating (viz. power level, heating temperature and RPM of stirrer) for improving the qualities of the soymilk.

RESEARCH FINDINGS

1. Effect of Microwave heating on antinutritional factor of soymilk

Soybean slurry was exposed to different microwave power levels ranging from 20% to 80% and the changes in the anti nutritional factors with respect to increases power level were estimated and compared with the control sample (i.e. without microwave heating).

Antinutritional factors of milk were estimated in term of Trypsin Inhibitor activity, Total Phenol content and Phytic acid content. It was observed that antinutritional factor of microwave extracted soy milk were comparatively less than control sample. The total phenol content was found to decrease with increase in the microwave power level as shown in Fig. 1. The values ranged from (13.8 mg GAE/100 gm of soymilk) for control sample to 6.3 mg GAE/100 gm of soymilk for the maximum power level. Similarly Phytic acid content was also estimated for the microwave treated soymilk and compared with the control. It was observed that the maximum reduction was at the highest power level applied (ie. 80%) Fig. 1. The values ranged from (225 mg/gm of soymilk) for control sample to (10 mg/gm of soymilk) for the maximum power level.

2. Effect of different heating methods on Tofu characteristics

The textural properties of tofu produced from three different heating methods namely Microwave heating, Ohmic Heating and conventional heating were compared (Table 1). The wide range of hardness indicated that different heating methods produced different textures of tofu. This may be due to the different water holding capacity and yield obtained from different heating methods of soymilk.

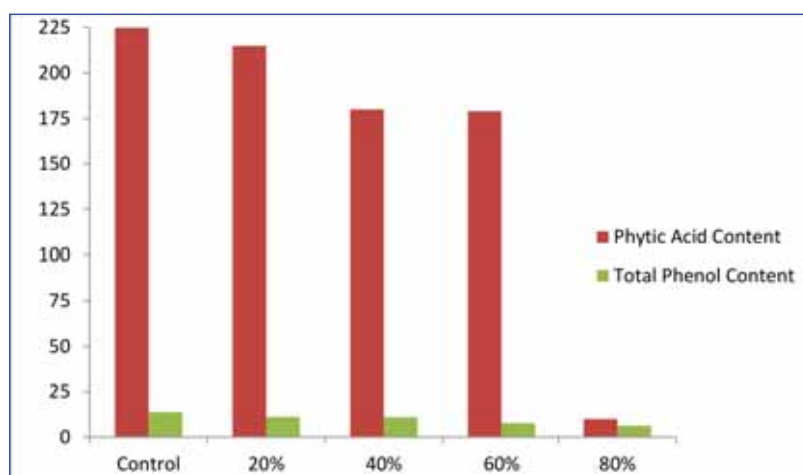


Fig. 1. Effect of microwave power level on the phytic acid and total phenol content of soymilk

TABLE 1. TEXTURE PROFILE ANALYSIS OF TOFU PRODUCED BY THREE DIFFERENT HEATING METHODS

Heating methods	Hardness (g)	Springiness (mm)	Chewiness	Cohesiveness (g.s)	Gumminess (g)
Conventional	226.087±0.008	0.574±0.001	59.197±0.002	0.450±0.0001	102.595±0.052
Microwave	229.469±1.717	0.593±0.001	67.543±0.022	0.500±0.0100	130.935±0.023
Ohmic	165.003±0.016	0.550±0.010	35.824±0.014	0.400±0.0060	66.340±0.020

RESEARCH OUTPUT

- Microwave assisted extraction improved the yield and shelf life of soymilk.
- Antinutritional factors of microwave heated soymilk are comparatively lower than conventional soymilk.
- Properties of dairy analogues from microwave treated milk are better than conventional treated milk.

FUTURE PLANS

Functionality of soymilk can be measured in terms of protein digestibility and availability in soymilk. Effect of power level of microwave heating on protein digestibility and solubility of soymilk will need to optimize and compare with control sample.

PROJECT TITLE	: Process for preparation of high protein, high fibre rich nutribar
PROJECT TEAM	: PI : Dr. C. Anandharamakrishnan Co-PI: Dr. V. Hema
PROJECT START AT	: Feb 2017

RESEARCH OBJECTIVES

Development of high protein, high fibre rich nutribar for meal and snack replacement.

RESEARCH FINDINGS

High protein, high fibre nutribar was made with agglutinate palm sugar instead of sucrose and flavoring along with *Madhuca indica*, *Moringa oleifera* and *Salvia hispanica*. Proximate analysis and fatty acid profile was carried out for the nutribar samples to determine their composition. All the samples were analyzed in triplicate using standard analytical methods described by AOAC. The analytical results of developed high protein and high fibre nutribar were given in the Table 1.

The protein values (12.43g/100g) found in nutribars is high compared to other commercially available ones. The fat content (4.63g/100g) is found within the range of 2.5 to 7 % of commercial bars. The high level of fiber is found in nutribar (12.6g/100g), qualifies as a fibre rich product. The total fatty acid contains is 4.63%, comprising unsaturated fatty acids (2.63%) and saturated fatty acid (2%), The total fatty acid found in nutribar is 4.63% which is a composition of saturated (2%) and unsaturated fatty acid (2.63%). The unsaturated fatty acid comprises PUFA (1.99%), MUFA (0.62%) and hypogeic acid (0.014%). Hypogeic acid is also known as (Z)-7-Hexadecenoic acid. The developed nutribar showed low moisture content (8 to 9%) which contributes to greater chemical and microbiological stability and is in accordance with international standards of product moisture which should stay below 15% for longer stable shelf life. Nutribar has high protein than those usually found in cereal bars available commercially. The present invention can be used by children as a meal replacement food as it provides equivalent nutritional benefits for their growth and development. Nutribar has 2.6 times more energy than a high protein milk chocobar, 4 times more carbohydrates than a milk chocobar and 6.3 times more fibre than a high protein milk chocobar. The comparison of proximate values of nutribar with the commercial snack bars and popular cooked foods are presented in Table 2 and 3.

TABLE 1. PROXIMATE COMPOSITION OF NUTRIBAR (G/100g IN DRY BASIS)

Product	Energy (kcal)	Protein	Fat	Fibre	CHO	Ash
Nutribar	317.79	12.43	4.63	12.6	56.6	4.11

TABLE 2. COMPARISON OF PROXIMATE VALUE OF NUTRIBAR WITH COMMERCIAL SNACK BARS

Product	Energy (Kcal)	CHO (g)	Protein (g)	Fat (g)	Fibre (g)
NUTRIBAR	317.79	56.6	12.43	4.63	12.6
Milkchoco nutribar	121	14	11	2.5	1
Blueberry delight	230	35	12	6	0
Chocolate supreme	134	22	5	3	0
Brownie snackbar	100	19	3	3	0
High protein milk chocobar	122	14	12	2.5	2
Peanut caramel bar	260	36	13	7	8



Fig. 1. NutriBar core enrobed with (a) dark, white and milk chocolate. The base molded into wafer cones and used as a filling for (b) cone ice creams, (c) candy drops and (d) lollipops with the core bar inside.

TABLE 3. COMPARISON OF PROXIMATE VALUE OF NUTRIBAR WITH POPULAR COOKED FOODS

Name of the Product	Energy (Kcal)	Protein (g)	Fat (g)	CHO (g)
Nutribar	317.79	12.6	4.63	56.6
Idly	135	6.36	0.62	26.31
Malted milk	89.43	3.9	3.6	10.3
Scrambled egg with milk and fat	193.5	10.6	15.8	1.6
Oat meal porridge	185	6.7	3.5	32.5
Whole wheat bread	254.16	9.5	4.1	47.08
Banana	88	1.2	0.3	23
Ginger ale	33.87	-	-	8.7
Yoghurt (cow, whole milk)	56.73	3.2	3.0	4.3
Human milk	67.74	0.9	4.5	6.7
Corn flakes	440	8	-	96

The nutribar core can further be enrobed with a variety of chocolates such as dark chocolate, white chocolate and milk chocolate. The base can also be molded directly into wafer cones and used as a filling for wafer biscuits and cone ice creams, drops and lollipops.

RESEARCH OUTPUT

- Developed nutribar is rich source of protein and dietary fibre and a good source of energy for people in need of high energy and high protein diet
- Nutribar contains concentrated palm sugar which gives the consumer an immediate burst of energy along with the adequate supply of micronutrients
- Nutribar is a gluten free, unbaked product designed for the population with celiac disease

FUTURE PLANS

- The protein qualities of the developed nutribar will be studied and the process development will be conducted for the development of nutribar for children of various age groups.

PROJECT TITLE	: Choco rice flakes
PROJECT TEAM	: PI : Dr. M. Durgadevi
PROJECT START AT	: May 2016

RESEARCH OBJECTIVES

- To study the impact of extrusion in processing rice flakes from rice flour
- To study the effect of flavor addition in the extruded rice flakes

RESEARCH FINDINGS

The choco rice flake was prepared with the mix of rice flour, cocoa powder and icing sugar in four different ratios of 2:1:1 (T1), 3:1:1 (T2), 4:1:1 (T3) and 5:1:1 (T4) respectively. The mix with a moisture content of 14% was extruded in twin screw extruder at a barrel temperature of 80 to 120°C operated in the speed range from 200 to 400 rpm. The extruded choco flakes (Fig. 1) from the combination of 3:1:1 (T2) ratio (250 rpm) was found to be acceptable based on the physical and sensory values (Table 1).

RESEARCH OUTPUT

- Choco rice flakes was produced directly from rice flour and not from paddy which was well received by rice millers as the technology gave a good yield compared to conventional method of flaking
- The product can be used as RTE breakfast food soaked in milk or a snack item
- Economical compared to corn flakes available commercially
- The technology has been transferred to Kalady Rice Millers Consortium, Kerala

FUTURE PLANS

Studies on fortification/enrichment of nutrients through extrusion technology can be conducted.



Fig. 1. Choco rice extrudate and flakes

TABLE 1. PHYSICAL AND SENSORY VALUES FOR THE DEVELOPED CHOCO RICE FLAKES

S.No.	Parameters Analyzed	Values
1.	Hardness of the extrudate	0.52 ± 0.076 kg/sq.cm
2.	Average flake length	2.5 to 4.8 cm
3.	Soaking time	3-4 min
4.	Flaking yield	75.8 ± 0.94 (%)
5.	Sensory value for overall acceptability	8.5 ± 0.58

PROJECT TITLE	: Dry mix formulations for millet idli and dosa
PROJECT TEAM	: PI: Dr. R. Vidyalakshmi
PROJECT START AT	: Jan 2016

RESEARCH OBJECTIVES

- To develop millet idli/dosa dry mix formulations.
- To study the proximal and sensory attributes of millet idli/dosa dry mix.

RESEARCH FINDINGS

In the present scenario to overcome the cumbersome process of making idli batter and to make idli making easy, the dry mix formulation is prepared. Due to the increasing demand for millets, rice is being substituted fully for millet and the combination of millet and black gram is standardized herewith to develop millet idli/dosa dry mix formulation. Millets viz. finger millet, kodo millet, little millet, foxtail millet, barnyard millet in different ratios, under dry conditions was studied. Of the different combinations of millet flour & black gram flour tried, the ratio of 2:1 was found to be acceptable. About 1-1.5% table salt was added. Dry form yeast and lactic acid bacterial cultures are used as fermenters. Various combinations of inoculum were studied and found 1% of 1:1 ratio inoculum to be appropriate. This resulted in 2-3 hours fermentation when compared to the conventional fermentation of 10-12 hrs, and the idli qualities were good and acceptable. The ingredients are mixed thoroughly using a ribbon blender. The blended flour is packed and stored for further use. This blended flour is the millet idli/dosa mix which can be used as dry mix for making idli or dosa (Fig. 1).

Required quantity of the millet idli/dosa mix is taken and mixed with twice the volume of water for making batter. Per kilogram of dry mix will yield 50 to 60 nos. of idli (each idli weighing 50-55 g) & 15-20 nos. of dosa (each dosa of 10-15 cm dia). Shelf life of the idli dry mix is three months. The quality of idli and dosa from dry mix is found to be good with soft texture and acceptable quality (Fig. 2). The physico-chemical changes during fermentation of idli batter viz. increase in batter volume as given in Fig. 3, bulk density, pH and titrable acidity (in terms of % lactic acid) were studied. The bulk density decreased upon fermentation. Also, it was observed that the entrapment of air/gas pockets is responsible for batter density.

In millets, an important feature is its high fibre content, which is recognized for its hypoglycemic effects. The major nutrition composition as given in Table 1, i.e. protein, fat, carbohydrate and crude fibre content of different millets are significantly higher than other cereals. It is evident that millets contain more protein (11-16%) than normal rice which is usually used for idli preparation. The study indicated the potential for utilization of millets in idli/dosa formulations. A sensory evaluation was conducted to decipher perceptive tastes and expectations. The variables used in this project as descriptives are, colour, texture, taste, flavour, porosity, overall acceptability. The sensory attributes are scored based on the 9-point Hedonic scale and the mean acceptability scores obtained by the sensory evaluation were recorded. The product has a very soft and spongy texture and a desirable flavour and



Fig. 1. Millet idli/dosa mix



Fig. 2. Millet idli and dosa



Fig. 3. Batter – before fermentation

Batter – after fermentation

Millet idli

taste. Finger millet dosa scored highest dosa for overall acceptability followed by little millet dosa for the quality attributes. Regarding the colour and taste attributes, the highest score was obtained by finger millet dosa followed by all other dosa items.

Except the little millet idli and kodo millet dosa, the texture attributes was found to be maximum for all other preparations. Results revealed that there was significant difference among the millet based idli and dosa varieties in variations such as appearance, colour, flavour, texture, taste and overall acceptability. The incorporation of millet in idli/dosa dry mix formulation paves way for a protein rich convenient food, in a more hygiene and increased storability than the wet batter. This also imparts value addition to millets and popularizes millet and millet based foods. This technology is useful for farmers, entrepreneurs and SHGs involved in food processing.

RESEARCH OUTPUT

- Ragi (Finger millet) idli/dosa dry mix
- Thenai (Foxtail millet) idli/dosa dry mix
- Samai (Little millet) idli / dosa dry mix
- Kuthiravalli (Barnyard millet) idli / dosa dry mix
- Varagu (Kodo millet) idli / dosa dry mix

TABLE 1. PROXIMAL CONTENT OF MILLET IDLI/DOSA DRY MIX

Proximal (g/100g)	Little millet (Samai)	Kodo millet (Varagu)	Barnyard millet (Kudiraivali)	Finger millet (Ragi)	Foxtail millet (Thinai)
Protein	16.26	11.67	13.75	11.67	12.09
Fat	4.08	4.47	4.54	4.02	4.36
Carbohydrate	61.5	65.47	63.39	64.17	65.39
Ash	1.19	1.84	1.92	1.83	1.19
Fiber	5.56	5.24	5.79	6.7	5.56
Moisture	11.41	11.31	10.61	11.61	11.41
Energy (Kcal)	347.76	348.79	349.42	339.54	349.16

FUTURE PLANS

- Training on developing millet idli/dosa mix will be imparted.
- Technical know-how will be transferred to farmers, entrepreneurs and SHGs.
- To be incorporated with micronutrients for women and children

EXTERNAL STUDENT RESEARCH PROJECTS

8

IICPT is allowing the students from other institutions to conduct part of their research project within the campus under the supervision of our faculty members.

LIST OF EXTERNAL PROJECT STUDENTS DURING 2016–2017

Sl. No.	Name of the Student	Degree	College / University	Research Title
1	P. Preethi	B.Tech.	Government College of Technology, Coimbatore	Quorum sensing inhibitory & antimicrobial activities of unifloral Indian Honey
2	S. Anu			Effect of preservatives on microbial quality of sugar cane juice
3	A. Priya			Production of improved ragi porridge through random mutation of Lactobacillus bacteria
4	A. Rahimunisha,	M.Sc.	Srinivasan College of Arts and Science, Perambalur	Study on the effect of non-thermal process on microbes in idli batter.
5	A. Arulmozhi,			Production of Bacteriocin from onion peel waste through Lactobacillus species
6	D. Saraswathi			Antimicrobial activities of medicinal plants against microbes infecting coconut kernel
7	R. Praveena			Effect of fumigation and biotic factors in pulse beetle on blackgram
8	V.G. Vishnupriya	B.Tech.	Adhiyamaan College of Engineering, Hosur	Effect of pretreatment on cotton seed for Gossypol free food products
9	R. Sangavi	B.Tech.		
10	C.V. Anirudh	B.Tech.	Sri Venkateswara College of Engineering, Sriperebudur	Development of gluten free bread and its related products
11	S. Priyadharcini	B.Tech.	Sree Sastha Institute of Engineering and Technology	Study on extending shelf-life of selected fruits and vegetables
12	M. Dhanalakshmi	B.Tech.		

Sl. No.	Name of the Student	Degree	College / University	Research Title
13	S. Akash	B.Tech.	Madha Engineering College	Development millet based non-dairy probiotic beverage
14	Divya Sunny	B.Tech.	Karunya University, Coimbatore	Study on drying and extraction of oil from ultrasound assisted Banana peel waste (Grand Nine Variety)
15	Thota. Anjaneyulu	M.Sc.	GITAM Institute of Science, GITAM University	Effect of spray drying on quality of milk and butter milk
16	Lethavadla Srinath			Edible coatings Development by using pectin which is extracting from sweet lime peel waste
17	A. Benedicta Lucia	B.Tech.	Pavender Bharathidasan college of Engineering and Technology, Tiruchirappalli	Identification and characterization of pathogens from fresh and treated <i>Coraindrum sativum</i> and its antimicrobial activity
18	J. Balasankari			
19	Ms. Leticia Amoakoah Twum	Research Scientist	Radiation Technology Centre, Ghana	Development of A Soybean based Composite Flour and Food Product to improve the Nutritional Intake of Low Income Household using Local Food Products

FOOD PROCESSING BUSINESS INCUBATION CENTRE ACTIVITIES

9

Food Processing Business Incubation Centre (FPBIC) of IICPT is offering various skill development trainings, technical guidelines programs and incubation services to the stake holders. The details of the same for the last year is detailed in the table below.

TECHNICAL GUIDELINES & TRAINING (6 MONTHS)

Sl.No.	Date	Title of the Technology/Product	Client Name & Place	Beneficiaries
1.	11.05.2016	Value addition of coconut	Santhakumar, Pollachi	3
2.	23.05.2016	Value addition of millets	A. Sudha, Chennai	3
3.	02.06.2016	Preservation of Palm Jaggery syrup	A. Saraswathi, Chennai	3
4.	13.06.2016	Processing of health mix	M. Alagurajan, Virudhunagar	3
5.	13.06.2016	Milling techniques of Steamed rice	S. Balavignesh, Pudukkottai	3
6.	20.06.2016	Processing of carbonated fruit beverage	R. Murugadas, Thiruvarur	3
7.	04.07.2016	Processing of Green leaves paste	S. Sindhu, Mayiladuthurai	3
8.	04.07.2016	Processing of Masala	R. B. Gnanavel, Vellore	3
9.	05.07.2016	Preparation of cookies	U. Gowri Shankar, Thanjavur	3
10.	14.07.2016	Processing of cereals	Amirtha Pandian, Thanjavur and MJ Tech foods, Thanjavur	6
11.	19.07.2016	Oil Extraction	M. Prabanchan, Madurai	3
12.	19.07.2016	Flax Seed Bar	R. Karthikeyan, Chennai	3
13.	21.07.2016	Value Added Products from Pulses and Millets	Mr. P. Kapilan, Madurai	3
14.	21.07.2016	Processing of Namkeen	Mrs. K. Jaisree, Secunderabad	3
15.	17.08.2016	Processing of Millet Cookies	Mr. K. E. Karthikeyan, Theni	3
16.	19.08.2016	Value Addition of Moringa leaves and pulp	Mr. V. Arumugam, Nagercoil	3
17.	19.08.2016	Value Addition of Coconut	Mr. P. Rajasekaran, Thanjavur	3
18.	29.08.2016	Processing of spirulina incorporated food products	Dr. P. Kalaiselvi, Trichy	3
19.	30.08.2016	Post harvest techniques for mushroom	Ms. V. Kanimozhi, Thanjavur	3
20.	31.08.2016	Dehydration of Dates	Mr. S. Nizamudden, Dharmapuri	3
21.	27.09.2016	Millets and Traditional Rice Based Biscuits	Vadamalai, Ellupur	3

Sl.No.	Date	Title of the Technology/Product	Client Name & Place	Beneficiaries
22.	14.10.2016	Processing of Tomato	M. R. Samy, Karaikudi	3
23.	08.11.2016	Pappad Processing	S. Hariharan, Madurai	3
24.	08.11.2016	Value added products from kappa carrageenan	M. Prasanna, Kumbakonam	3
25.	10.11.2016	Beverage Technology	R. Krishnam, Chennai	3
26.	16.11.2016	Processing of Masala powders and pickling techniques	C. Jagatheesan Nadar, Tirunelveli	3
27.	22.11.2016	Seasoning for nuts	Mr. M. M. Sheik Abdul Kader, Cuddalore	3
28.	09.12.2016	Development of Instant food mixes from cereals and millets	Christy Friedgram Industry, Namakkal	3
29.	09.12.2016	Development of value added products from Eggs, cereals and pulses	Suvarnabhoomi Enterprises Pvt. Ltd, Namakkal	3
30.	09.12.2016	Ready to cook mixes products (Cereals and Pulses based)	Rasi Nutri Foods, Namakkal	3
31.	13.12.2016	Value added products from Moringa	K. Subburaj, Madurai	3
32.	27.12.2016	Peanut Candy	J. Noushat Aly, Karaikal	3
33.	05.01.2017	Value addition of Mango	Ramakrishnan T, Chennai	3
34.	10.01.2017	Retort packing of Curry foods	M. Lakhshmanan, Chennai	3
35.	11.01.2017	Fruit Beverages	M. Karthikeyan, Chennai	3
36.	17.01.2017	Processing of pickles	S. Thilagavathi, Virudhunagar	3
37.	17.01.2017	Value addition of fruits and vegetables	V. Prabhu, Karur	3
38.	19.01.2017	Value addition of Fruits and Nuts	X. Benjamin Franklin, Trichy	3
39.	13.02.2017	Millet Processing	K. T. Kathiravan, Thanjavur	3
40.	28.02.2017	Millet and Cereal Based Value Added Products	K. R. V. Velmurugan, Virudhunagar	3
41.	02.03.2017	Soft Drinks (Ice lemon Tea with More Flavour)	R. Jagan, Thanjavur	3
42.	06.03.2017	Processing of Fruit Beverages and Jelly	M. Abdul Kader, Thanjavur	3
			Total	129

SKILL ADVANCEMENT IN-PLANT TRAINING (2 MONTH)

Sl.No.	Date	Name of the Institute and Place	Beneficiaries
1.	08.07.2016 – 07.09.2016	College of Home Science, Central Agricultural University, Tura, Meghalaya	7

EXECUTIVE TRAINING (5 DAYS)

Sl.No.	Date	Title of the Technology	Beneficiaries
1.	04.04.2016 – 08.04.2016	Beverage Technology	2
2.	09.05.2016 – 13.05.2016	Processing of fruits and vegetables	3
3.	18.07.2016 – 22.07.2016	Value addition of Fruits and Vegetables	1
4.	25.07.2016 – 29.07.2016	Processing of RTS, RTC, RTE	3
5.	01.08.2016 – 05.08.2016	Processing of Masala Powder and Pickling Techniques	2

Sl.No.	Date	Title of the Technology	Beneficiaries
6.	08.08.2016 – 12.08.2016	Value Addition of Fruits and Vegetables	2
7.	03.10.2016 – 07.10.2016	Processing of Cakes, Cookies, bread and pastries	2
8.	17.10.2016 – 21.10.2016	Beverages Technology	2
9.	07.11.2016 – 11.11.2016	Processing of Cereals, Millets and Pulses	4
10.	21.11.2016 – 25.11.2016	Baking Technology	2
11.	05.12.2016 – 09.12.2016	Value addition of seasonal fruits	1
12.	16.01.2017 – 20.01.2017	Training on Food Processing	7
13.	23.01.2017 – 27.01.2017	Value addition of Fruits and Vegetables	2
14.	23.01.2017 – 28.01.2017	Bakery Science and technology	10
15.	20.02.2017 – 24.02.2017	Processing of masala powders and pastes	3
		Total	46

EXECUTIVE TRAINING (3 DAYS)

Sl.No.	Date	Title of the Technology	Beneficiaries
1.	19.09.2016 – 21.09.2016	Baking Technology	1
2.	04.10.2016 – 06.10.2016	Sugar based fruit products-candy, bar, jam, jelly	1
3.	24.10.2016 – 26.10.2016	Processing of Cereals, Millets, Pulses and Extrusion Technology	3
4.	01.11.2016 – 03.11.2016	Pickles and Masala processing	2
5.	28.12.2016 – 30.12.2016	Processing of RTE and RTC foods	1
6.	03.01.2017 – 05.01.2017	Value addition of fruits and vegetables	2
		Total	10

BEGINNERS TRAINING (1 DAY)

Sl.No.	Date	Title of the Technology	Beneficiaries
1.	05.04.2016	Value addition of seasonal fruits	5
2.	13.04.2016	Value addition of Mango	33
3.	13.04.2016	Processing of grains and gram based products	4
4.	19.04.2016	Processing of Masala powders	4
5.	21.04.2016	Processing of cold extruded foods	2
6.	21.04.2016	Processing of cold extruder foods	2
7.	22.04.2016	Sugar confectionery	2
8.	26.04.2016	Processing of fruit beverage	3
9.	28.04.2016	Value addition of millets	9
10.	03.05.2016	Value addition of fruits and vegetables	14
11.	05.05.2016	Processing of masala powder	4
12.	11.05.2016	Processing of cookies & cakes	6
13.	12.05.2016	Processing of RTC & RTE	8
14.	17.05.2016	Processing of tomato products	4
15.	19.05.2016	Processing of bakery goods	1

Sl.No.	Date	Title of the Technology	Beneficiaries
16.	23.05.2016	Instant food mixes for Infant and young children	2
17.	27.05.2016	Value addition of mango	4
18.	27.05.2016	Dehydration of fruits and vegetables	5
19.	30.05.2016	Processing of masala paste	1
20.	02.06.2016	Pickling of fruits and vegetables	2
21.	13.06.2016	Value addition of cereals, millets and pulses	2
22.	13.06.2016	Preservation of fruits and vegetables	7
23.	24.06.2016	Processing of Mushroom	4
24.	28.06.2016	Processing of Cakes	6
25.	04.07.2016	Preparation of Ice-creams	4
26.	08.07.2016	Value addition of tomatoes	4
27.	14.07.2016	Value addition of Fruits and vegetables	5
28.	18.07.2016	Baking Technology	4
29.	20.07.2016	Processing of Cereals, Millets and Pulses	12
30.	21.07.2016	Training on Pappad	3
31.	26.07.2016	Functional Bakery Products	3
32.	27.07.2016	Pickling Techniques of Fruits and Vegetables	12
33.	01.08.2016	Value Addition of Jackfruit and Banana	6
34.	09.08.2016	Value Addition of Mushroom	3
35.	11.08.2016	Commercial Production of Bread and Related Products	7
36.	17.08.2016	Value Addition of Millets	5
37.	18.08.2016	Value Addition of Pulses	16
38.	19.08.2016	Sugar Confectionery	4
39.	23.08.2016	Ready to cook food products	10
40.	29.08.2016	Value addition of Guava, amla and grapes	9
41.	29.08.2016	Value addition of millets	24
42.	02.09.2016	Value addition of coconut and amla	21
43.	06.09.2016	Processing of fruits and vegetable products	2
44.	19.09.2016	Processing of baked products	2
45.	26.09.2016	Dehydration of Fruits and Vegetables	4
46.	30.09.2016	Processing of Cereals and Millets Products	5
47.	07.10.2016	Value Addition of Mushroom	4
48.	10.10.2016	Dehydration of Fruits and Vegetables	3
49.	17.10.2016	Processing of Fruit Juices	6
50.	21.10.2016	Processing of Malted drinks and Health mixes	2
51.	24.10.2016	Processing of Ready-to-cook products	1
52.	01.11.2016	Processing of Masala powders and Pastes	5
53.	03.11.2016	Processing of Pickles	3
54.	07.11.2016	Value addition of Cereals, Millets and Pulses	8

Sl.No.	Date	Title of the Technology	Beneficiaries
55.	11.11.2016	Beverages Processing	4
56.	15.11.2016	Preparation of Ice cream	4
57.	21.11.2016	Processing of grains and gram based products	4
58.	25.11.2016	Processing of cookies and cakes	3
59.	30.11.2016	Processing of rice, cereals and pulses	25
60.	09.12.2016	Pickling techniques	9
61.	14.12.2016	Processing of instant snack mixes	1
62.	16.12.2016	Value addition of food crops	24
63.	23.12.2016	Functional Cookies	2
64.	28.12.2016	Extrusion Technology	3
65.	03.01.2017	Value addition of Seasonal Fruits	2
66.	05.01.2017	Processing of Food crops	16
67.	09.01.2017	Processing of Ice creams and cakes	1
68.	17.01.2017	Processing of Traditional Foods	4
69.	20.01.2017	Value addition of Rice	25
70.	23.01.2017	Value addition of Mushroom	5
71.	27.01.2017	Value addition of Amla	3
72.	17.02.2017	Value addition of Mushroom	5
73.	17.02.2017	Canning and retort processing of fruits and vegetables	12
74.	20.02.2017	Value addition of green leaves and root vegetables	1
75.	06.03.2017	Drying and Dehydration of Fruits and Vegetables	8
76.	10.03.2017	Processing of Cereals, Millets and Pulse based Products	4
77.	13.03.2017	Processing of Masala Powders and Pastes	6
78.	17.03.2017	Value Addition of Fruits and Vegetables	15
Total			517

INCUBATION SERVICE

Sl. No.	Equipments used	Name of the Product(s)	Date(s)
1.	Pasta machine and tray dryer	Ragi Pasta, Millet Pasta, Ragi Vermicelli	01.04.2016, 04.04.2016, 13.04.2016, 21.04.2016, 22.04.2016, 25.04.2016, 27.04.2016, 02.05.2016, 04.05.2016, 11.05.2016, 23.05.2016, 07.06.2016, 10.06.2016, 15.06.2016, 11.08.2016, 17.08.2016, 12.09.2016, 14.09.2016, 17.10.2016, 16.11.2016, 18.11.2016, 28.11.2016, 09.12.2016
2.	Drum dryer, Flaking machine, Tray dryer	Grains Premix, Millet Premix	08.04.2016, 18.04.2016
3.	Planetary mixer, Rotary Oven	Cookies, cake	11.04.2016, 15.04.2016, 22.04.2016, 25.04.2016, 26.04.2016, 04.05.2016, 20.05.2016, 30.05.2016, 29.06.2016, 15.07.2016, 19.07.2016, 02.09.2016, 05.10.2016, 06.01.2017, 02.02.2017, 09.03.2017, 19.12.2016

Sl. No.	Equipments used	Name of the Product(s)	Date(s)
4.	Ribbon Blender	Porridge mix	11.04.2016
5.	Tray dryer	Garlic Flakes	13.04.2016
6.	Mobile Processing Unit	Tomato puree	15.04.2016
7.	Drum drier	Whey protein concentrate drying, Quinoa	05.05.2016, 07.11.2016
8.	Pulverizer	Coconut cake grinding, Moringa powder	11.05.2016, 15.07.2016
9.	Tray drier	Dehydration of brinjal	19.05.2016
10.	Tray dryer, Blanching unit	Millet Pasta	23.05.2016
11.	Drum dryer, Tray dryer	Rice bran	24.05.2016
12.	Vermicelli machine, Tray dryer	Millet vermicelli	24.05.2016, 30.05.2016
13.	Flaker Tray dryer	Ragi flakes	27.05.2016
14.	Tray drier	Onion, Chilli drying	06.07.2016
15.	Colloidal ball mill. Meat bowl chopper, Steam double jacketed unit and Boiling LPG	Extract from Vegetables	04.08.2016
16.	Tray drier, Milling unit	Moringa leaves powder	18.08.2016
17.	Tray drier, spray drier, fluidized bed dryer	Dhal	30.08.2016
18.	Hammer mill	Cookies	02.09.2016
19.	Steam jacketed kettle, blancher, pulper, boiler	Processing of tomato and grapes	20.09.2016
20.	Rice flaker, roaster	Millet flakes	27.09.2016
21.	Flaker, tray drier, fluidized bed drier	Dhal Flakes	27.09.2016
22.	Band sealer, retort pouch sterilization machine	Processing of Rice and veg curry	30.09.2016
23.	Vacuum packaging, spray drier	Flax oil, green gram powder	05.10.2016
24.	Deep fryer	Potato chips	13.10.2016
25.	Tray drier, flaker, roaster	Flakes-Foxtail and horse pea	13.10.2016
26.	Dough sheeter, planetary mixer, rotor oven	Chappathi	19.10.2016
27.	Rotor Oven, Blender(Planetary mixer)	Rusk	21.10.2016
28.	Blancher, Pulper, Steamer, Liquid filling machine, Autoclave	Mobile Processing Unit-Demo on value addition of fruits and vegetables	27.10.2016
29.	Vegetable cutter, Tray dryer	Dehydration of Papaya, Beetroot	11.11.2016
30.	Ripening chamber	Banana	15.11.2016
31.	Pasta machine, tray drier and blanching unit	Millet health mix	24.11.2016
32.	Flaker and blancher	Flakes	14.12.2016
33.	Tray dryer	Drying Pasta, Papaya, beetroot	06.01.2017, 14.02.2017

Sl. No.	Equipments used	Name of the Product(s)	Date(s)
34.	Flaker, extruder, tray drier	Extruded and flaking	19.01.2017
35.	Fluidized bed drier	Agglomerated powder	20.01.2017
36.	Uruli roaster, flaker	Flaking	27.01.2017
37.	Microwave dryer, UV sterilization, Ozone analyzer	Cumin	07.02.2017
38.	Roaster, Flour Mill, Ribbon Blender	Idly Chilli Powder	07.03.2017

MOBILE PROCESSING UNIT

Date	Programme	Coordinator	No. of Trainings	Total No. of Beneficiaries
1.4.2016	One day workshop on processing of fruits and vegetables	Sastra University	1	50
17.5.2016	Nel Thiruvizha, Thiruthurai poondi	Mr. Jeyaraman Asst. Coordinator Consumer Research Education Action Training Empowerment	1	1500
17.6.2016	Workshop on Value addition of Onion, Chettikulam, Perambalur	District Collectrate	1	300
24.6.2016 – 26.6.2016	Kodai Vizha, Cuddalore	District Collectrate	1	3500
22.7.2016 – 25.7.2016	Thinamalar Agri Expo, Vellore	District Collectrate	1	2000
20.9.2016	Scheme of Community Development, Periyar Centaury Polytechnic College, Vallam, Thanjavur	Dr. R. Mallika, Principal	1	150
9.10.2016 – 12.10.2016	Pasumaivikadan Agri Expo., Erode	Anandavikatan Publisher Pvt. Ltd., Erode	1	3000
1.11.2016	Kauveri Engineering College, Salem	Mahagurusetra Celebration, Salem	1	3000
29.12.2016	Farmers Meet, Thanjavur	SINDICATE, Chennai	1	150
24.02.2017 – 27.02.2017	"MADITSSIA Food Tech 2017"	Tamukkum Grounds, Madurai	1	6000
		Total	10	19500

SUMMARY OF BUSINESS INCUBATION ACTIVITIES

Sl. No.	Training	No. of Training	No. of Beneficiaries
1.	Beginners training (1 day)	78	517
2.	Executive training (3 days)	6	10
3.	Executive training (5 days)	15	46
4.	Skill advancement In plant training (1 month)	1	7
5.	Technical guidelines service	42	129
6.	Incubation service	84	168
7.	MPU	10	19500
	Total	237	20377

IN-PLANT TRAININGS

Sl. No.	Programmes	Dates	Participants
1.	In-plant Training	4 to 29 April 2016	College students, CAEC, Bhila
2.	In-plant Training	1 to 27 May 2016	College students
3.	In-plant Training	1 to 30 June 2016	College students
4.	In-plant Training	15.07.2016 to 14.08.2016	College students

SHORT COURSES

SHORT COURSE CONDUCTED DURING 2016–17

Sl.No.	Programme	Dates	Participants
1.	Food Business Management	28.09.2016 – 30.09.2016	44 participants ranged from entrepreneurs, management faculties and students
2.	Quality analysis of fruits & vegetables	25.10.2016 – 27.10.2016	Industry person
3.	Instrumentation training	19.12.2016 – 21.12.2016	14 students from Bangalore International School, Bangalore

TRAININGS ATTENDED

IIFPT staff attended the following training programmes during 2016–17

Sl.No.	Name of Faculty	Dates	Programme	Venue
1.	Dr. K. Suresh Kumar	19.09.2016 – 23.09.2016	GIAN-IIT	Amritsar
2.		18.02.2017	Technical Co-operation workshop, India mission organized by Canadian Food Safety Inspection Agency and FSSAI	New Delhi
3.		13.03.2017 – 14.03.2017	FSMS Internal Auditor Training.	Pondicherry University
4.	Dr. Hema	13.06.2016 – 15.06.2016	Training of Trainer Workshop (TOT) for master trainers in Bakery Sector	Greater Noida
5.		12.07.2016 – 15.07.2016	Training of Trainer Workshop (TOT)	Coimbatore
6.	Dr. R. Vidyalakshmi	22.03.2016 – 23.03.2016	International Principles, Operation and Maintenance of LCMS-8040 Triple Quadrupole UFMS with LabSolutions Workstation	Singapore
7.		13.03.2017 – 14.03.2017	FSMS Internal Auditor Training	Pondicherry University
8.	Mr. Sandeep	13.06.2016 – 15.06.2016	Training of Trainer Workshop (TOT)	Noida
9.		12.07.2016 – 15.07.2016	Platform skill development training	Coimbatore
10.	Dr. Mahendran	10.08.2016 – 12.08.2016	COMSOL Multiphysics	Chennai
11.	Dr. Durga Devi	01.09.2016 – 10.09.2016	Master's Training of Trainers (ToT - Baking technician)	IIFPT, Thanjavur

Sl.No.	Name of Faculty	Dates	Programme	Venue
12.	Dr. Prathiba Singh	01.09.2016 – 10.09.2016	Master's Training of Trainers (ToT - Baking technician)	IIFPT, Thanjavur
13.	Dr. Jeyan Arthur Moses	30.01.2017 – 02.02.2017	COMSOL Multiphysics	Bangalore, India
14.	Dr. Bhuvana	15.01.2017	Hi-Tech equipment training by ICP-OES/ICP-MS by Perkin Elmer	IIFPT, Thanjavur

CONFERENCES, SEMINARS AND WORKSHOPS



Foodomics' 2016

Foodomics'16 is a National conference on Emerging Trends in Food Processing and Quality Assurance, organized jointly with the Department of Food Process Engineering, SRM University on 12–13 April, 2016 at SRM University, Chennai. Dr. Ram Rajasekaran, Director, CFTRI inaugurated the event and Dr. M. Loganathan, Director i/c, IICPT presided over the function. Following the inaugural session, technical sessions were held constituting invited speakers, student

presentations and posters presentations. Faculties of IICPT made presentations in the thematic areas of the conference. Around 200 participants including students, researchers and entrepreneurs participated in the conference. The compilation of the proceedings in the form of Souvenir was distributed to the participants and certificate of participation was also issued. Reorganization for best presentations in the form of awards was distributed. Valedictory was held concluding the seminar on the second day of the conference.



Workshop on Food Quality and Safety Management for Export of Processed Foods

IICPT Regional Centre Guwahati in association with Agricultural and Processed Food Products Export Development Authority (APEDA), Regional Office, Guwahati had organized a one-day workshop on 'Food Quality and Safety Management for Export of Processed Foods' on 23rd June 2016 at NEDFi Convention Centre, Dispur, Guwahati. A wide range of participants including exporters, entrepreneurs, industry representatives, scientists, academic faculties, students, NGOs, SHGs working in the food processing sector had actively participated in this event. In this program technical, managerial and regulatory



issues pertaining to food quality and safety management to market the products both at domestic and international levels were discussed at length. Eminent experts from relevant subject/expertise had delivered lectures on different thematic areas during the technical session.

Short-Term Training Programme on “Stored Product Protection” from 20th July to 22nd July 2016



A Short-term training programme on “Stored product protection” was conducted by Department of Primary Processing, Storage & Handling from 20.07.2016 to 22.07.2016. Seven trainees were participated in the training programme. Various lectures on modern storage structures, hermetic storage, biotic and abiotic factors affecting grain storage, ozone fumigation, pest repellents and biological control, Fumigation, Rodent management, demonstration on the identification of stored insects & insect and rodent management using traps, etc., were delivered by subject matter specialists from IICPT. Also, trainees were taken to field visit to CWC and TNCSC godowns and showed phosphine fumigation practices.

Open Day 2016

Commemorating the 114th birth anniversary of its founder Director, Dr. V. Subrahmanyan, the Institute was open to public on 17th September 2016 from



Shri. A. Annadurai, District Collector, Thanjavur inaugurated the event at IICPT



Demonstration of facilities and equipment to visitor



IICPT's successful beneficiaries displaying their products



Visitors at the cultural event on the theme 'food safety'

9:30 a.m. to 5:00 p.m. The event focussed on the theme of 'safe food for healthier nation', in which simple methods for determination of adulterants in common foods like honey, spices, milk etc. were demonstrated. Shri. A. Annadurai, District Collector, Thanjavur inaugurated the program in the presence of Shri. V. Chelladurai, General Manager, NABARD and Dr. C. Anandharamakrishnan, Director, IICPT. Shri. Parasuraman, Member of Parliament, Thanjavur Constituency, Dr. T. Sekar, DIG, Chief Security Officer, BHEL, Trichy, Dr. N. Ramachandran, Vice Chancellor,

Periyar Maniammai University, Thanjavur and Dr. Samiayyan, Dean i/c, Tamil Nadu Agricultural University, Eachankottai also participated in the event.

The event gathered around 7,000 participants, mainly from Thanjavur and nearby districts. Visitors had access to:

- demonstration of over 25 successful innovations, technologies and machineries (for on-farm processing) such as mobile grain conveyor, moringa leaf separator, rice puffing unit etc. developed at the Institute.
- 27 successful entrepreneurs incubated from IICPT who exhibited their products
- cultural shows by IICPT students to create mass awareness on food safety and hygiene practices
- state-of-the-art facilities at IICPT's food processing business incubation center

Training cum Demonstration on Value addition of Small Onion

A One Day training cum demonstration was organized for the benefit of Perambalur district onion farmers. The field level programme was organized at Chettikulam Village in Perambalur District on 17.06.16. Around 200 prospective onion farmers participated and witnessed the demonstration of gadgets developed at IICPT. The department of Agricultural marketing and Agri business Perambalur district coordinated and provide necessary amenities for organizing the program. Extensive media coverage was done and released.



Demonstration of IICPT technologies and interaction with farmers



'Mission Onion' – an initiative to relieve the burden of Perambalur farmers

Perambalur district of Tamil Nadu is the hub for small onions (Shallots), with cultivation in over 8000 hectares producing around 65,000 to 70,000 tonnes every year. However, during several instances, farmers report massive losses due to conventional methods of handling and storage. Considering these aspects, Indian Institute of Crop Processing Technology (IICPT), Thanjavur, with the support of the District Administration, Perambalur, has initiated the establishment of a processing cum incubation center for onion, at Chettikulam, Perambalur district. The unit will have provisions to make dehydrated products (including flakes and powders), pastes, vacuum packed fresh peeled onion, pickles and other allied products from onions. The facility will be developed with the technical expertise of scientists at IICPT and would be able to also handle other agricultural products, as and when need arises. The Director and the team also met the District collector, Shri. K. Nandhakumar, I.A.S. and discussed about the action plan, in the presence of District agricultural and horticultural officers.

National Seminar on “Challenges and Opportunities in Food Packaging”



Food Packaging has emerged intensely during recent years, mainly due to increased demand on safety of product, extension of shelf-life, cost efficiency, customer convenience and environmental issues. In this regard, a National Seminar on “Challenges and Opportunities in Food Packaging” was organized at IICPT on 23.09.2016. The following themes were covered:

- Nanotechnology in food packaging
- Biopolymer based packaging
- MAP, CAP, Active and Intelligent packaging
- Packaging standards for local & export market

Dr. Rajeshwar Shantayya Matche, Sr. Principal Scientist & Head, Food Packaging CSIR-CFTRI, Mysore, Dr. S. Nadana Sabapathi, Head, Food Engineering and Packaging, DFRL, Mysore and Mr. Sreedath Tulamandi, Asst. Director, IIP, Bangalore delivered lectures.

National Seminar on Recent Trends in Post-Harvest Pest Management at IICPT on 4th November, 2016

A one day National Seminar on “Recent Trends in Postharvest Pest Management” was organized at IICPT on 4th November, 2016. There were 140 participants from various colleges and institutes across the country.



Dr. Rakesh Kumar Sharma, Director, DFRL, Mysuru inaugurated the function and delivered the inaugural address. He highlighted the importance of protecting the food from the pests for food security and elucidated the work done in DFRL. Dr. Paul Fields from Agriculture and Agri-Food Canada, University of Manitoba, Winnipeg, Canada presented his guest speech on “New technologies to control stored products insect pests”. He shared his vast experience in the field of storage entomology and challenges in the grain storage pest management in particular to Canadian condition. He also explained about the innovative technologies available for managing the insects in grain storage.

Dr. Bhadriraju Subramanyam from Department of Grain Science and Industry, Kansas State University, USA delivered his lecture on “Development and validation of a model for predicting survival of young larvae of *Tribolium castaneum* exposed to elevated temperatures during heat treatment of grain-processing facilities”.

Dr. V. Selvanarayanan from Department of Entomology, Faculty of Agriculture, Annamalai University, Chidambaram presented on “Post-harvest pest management in fruits and vegetables”. The traditional and modern food storage practices were discussed by V. Palanimuthu, Professor and University Head, AICRP on PHET, University of Agricultural Sciences, GKVK, Bengaluru. Sh. S. Manivannan from CSIR-CFTRI, Mysore presented on “Efficient fumigation practices for management of pest of stored products”.



Two Faculties Participated at the International Conference at Kaohsiung, Taiwan

Dr. J. Alice and Dr. V.R. Sinija have attended annual 5th world congress on food and nutrition and presented technical papers. The conference was held at Kaouhsiung Exhibition Center, Taiwan, Republic of China between 18th and 20th November 2016. Around 400 participants from 57 countries participated in the conference.

Brainstorming on Growth of Agro-Processing (Food) Sector in North-Eastern Region



A brain storming session was conducted at LO of IICPT Guwahati to suggest the solutions to post harvest problems of North Eastern Region of India. It was observed that every state has its own set of untapped reservoirs of edible commodities in North East. The final suggestion lied around the concept of identification of untapped economy booster agri-produce food commodities and consecutive suitable processing techniques. The association of entrepreneurs with governing bodies like FINER will also boosts the implementation of new project ideas indulging the value-addition of such commodities.

Academicians of different organizations of different states such as NEHU of Tura, Meghalaya; CAU of Imphal, Manipur; Nagaland University; Tezpur University of Assam; Tea Research Institute of Tocklai, Assam etc. participated in the discussion.



Workshop on Food Processing Sector: Startup Opportunities, Investment and Digital Transaction at IICPT on 10th January 2017



A one day workshop on Startup and investment opportunities was jointly organised with State Bank of India. The workshop had technical sessions handled by both IICPT and SBI. SBI officials briefed about various financial opportunities for starting a food business. Around 350 farmers and budding entrepreneurs benefitted from the event. The event was organized at Dr. A.P.J. Abdul Kalam Hall at IICPT. After the opening remarks by Dr. N. Venkatachalapathy, Shri. Arunachalam Ganesan, Regional Manager, State Bank of India, Regional Business Office, Thanjavur felicitated the gathering. Then, Dr. C. Anandharamakrishnan, Director, IICPT delivered the presidential address. Shri. P. Sivakumar, Deputy General Manager (B&O), State Bank of India Administrative Office, Tiruchirappalli was the Chief Guest and delivered the chief guest address.

A workshop session was organized with two technical talks: viable technologies for startup in food sector by Dr. V. Hema and prospects of entrepreneurship in food processing sector by Dr. A. Amudhasurabi. This was followed by talks from SBI officials on investment & credit plan for food industries and digital Transactions for commercial establishments. After a panel discussion, the session was concluded.



Participation of IICPT in various events across the country

Event	Venue	Organisers	Date
Krishi Vikas 2016	Amaravati, Maharashtra	Govt. of Maharashtra	10 th – 13 th April, 2016
North East ASEAN Business Summit	City Convention Centre, Imphal	Indian Chamber of Commerce (ICC) along with Department of Commerce & Industries, Government of Manipur	7 th , 8 th & 9 th April, 2016
Krishi Unnati Mela 2016	New Delhi	IARI	15 th – 17 th March 2017
Kodai Vizha	Silver Beach Cuddalore	Govt. of Tamil Nadu	24 th – 26 th June 2016
Platform Skill Training	J.M. Bakers Academy, Coimbatore	National Skill Development Corporation (NSDC) & Food Industry Capacity and Skill Initiative (FICSI)	12 th – 15 th July 2016
Domestic and Export Entrepreneurial opportunities for Women and Youth	St. Joseph's College, Tiruchirappalli	Bharathidasan University and Women Entrepreneur Association for Tamil Nadu (WEAT)	24 th and 25 th June 2016
DinamalarAgri Expo	Fort Ground, Vellore	Dinamalar	22 nd – 25 th July 2016
Functional Foods to Achieve Nutrition and Health Security	Madurai	IICPT & TNAU	19 th September 2016
Agri Expo	Vellore	VIT University	3 rd – 4 th September 2016
11 th Annapoorna Trade Fair		Koelnmesse YA Tradefair Pvt. Ltd. and Federation of Indian Chamber of Commerce and Industry (FICCI)	22 nd – 24 th September 2016
Seminar on Value Addition of Food and Agri-products	Sona College of Technology, Salem	CII, Salem	8 th November, 2016
Agri Tech 2016	Thodopuzha, Idukki District, Kerala	Govt. of Kerala	4 th – 5 th November 2016
Agrovision Mela	Reshimbagh Ground, Nagpur, Maharashtra	Govt. of Maharashtra	11 th – 14 th November 2016
Inauguration of Maize and Onion Farmers Producer Company	Perambalur District	Farmers Producer Company	21 st December 2016
National Seminar on Recent Trends in Food Processing	Central University of Punjab, Bathinda	IICPT and Central University of Punjab (CUP)	9 th December 2016
Vibrant Gujarat	Gandhinagar, Gujarat	Govt. of Gujarat	9 th – 13 th January 2017
Rajasthan Food Protech 2017	Lalit Hotel, Jaipur	Govt of Rajasthan	19 th January 2017
Food Retail Conclave	Hotel Hyatt Regency, Chennai	In Assocham	20 th January 2017
National Seminar on Exploring Food Based Approaches for Sustenance	Chennai	M.O.P. Vaishnav College for Women	27 th January 2017
AAHAR-2017 International Food & Hospitality Fair	Pragati Maidan, New Delhi	India Trade Promotion Organization	7 th – 11 th March, 2017
MSME Awareness Programme	IIFPT	MSME Development Institute - Chennai	20 th March 2017

Memorandum of Understanding (MoU) Between IIFPT and Industries & Institutes

The institute has signed Memorandum of Understanding (MoU) with international and national universities and institutes for joint research programmes, exchange of knowledge, scientists and students.

International

Sl.No.	Name of the Institute	Date of MoU	Closing Date of MoU	Duration of MoU
1	Natural Resources Institute, Greenwich, London	28 th Feb 2017	28 th Feb 2021	5 Years

National

Sl.No.	Name of the College	Date of MoU	Closing Date of MoU	Duration of MoU
1	Jamal Mohamed College, Trichy	5 th March 2016	5 th March 2021	5 years
2	TNAU, Coimbatore	30 th March 2016	30 th March 2020	4 years
3	MS Swaminathan Research Foundation, Chennai	9 th August 2016	9 th Aug 2019	3 years
4	Central Electronics Engineering Research Institute, Chennai	17 th Nov2016	17 th Nov 2019	3 years
5	Sant Longowal Institute of Engineering & Technology, Longowal	9 th Dec2016	9 th Dec 2019	3 years

The Indian Institute of Food Processing Technology entered MoU's with various industries for research collaborations

Sl.No.	Name of the MoU'S Company	Date of MoU	Duration of MoU
1	Jaya Sathya Agro Food Products Pvt. Ltd., Pudhukottai	8 th March 2016	5 Years
2	Envisources Pvt. Ltd.	21 st April 2016	5 Years
3	Sameer, Mumbai	3 rd June 2016	3 Years
4	Aachi Masala Food (P) Ltd., (AMPL) Chennai	22 nd July 2016	5 Years
5	Nectar Fresh – Karnataka	30 th Aug 2016	3 Years
6	Provision Value Gard Pvt. Ltd., Chennai	10 th Feb 2017	6 months

License Agreement

Sl.No.	Name of the MoU's Company	Date of MoUs
1	Pavizham Healthier Diet Private Limited, Ernakulum	10 th Feb 2017

Agreements

Sl.No.	Name of the MoU'S Company	Date of MoU	Duration of MoU
1	M/s Toptech Exports and Imports Private Ltd., Ariyalur	10 th Feb 2017	1 Year
2	M/s Sreem Micro E Devices, Mannargudi	10 th Feb 2017	1 Year
3	Dr. Reddy's Laboratories Ltd., Hyderabad	10 th Feb 2017	-
4	M/s. Lakshmi Card Clothing Manufacturing Company Private Limited, Coimbatore	10 th Feb 2017	1 Year
5	M/s. Katama Biomed Private Ltd	5 th April 2017	1 Year

Implementation of Official Language - Hindi

Indian Institute of Crop Processing Technology (IICPT), Thanjavur received the “Karaylaya Smirti Deep-2016” for progressive implementation of Official Language at various official works, from Rajbhsha Sansthan, New Delhi. Dr. Akash Pare, Assistant Professor & Hindi Liasioning Officer of IICPT received this Award on 25/10/2016 at 81st Platinum Jubilee of Rajbhsha Sansthan, New Delhi. More than 50 different government organization’s representatives from all over India were participated in this program.

Hindi Diwas-2016 Celebrated at IIFPT

Hindi Diwas is celebrated every year on 14th September to pay tribute to the official language of India as Hindi which was adopted as the official language of Constituent assembly on September 14, 1949. The Constitution of India adopted Hindi in Devanagri Script as the official language of the union

under Article (343) in 1950. Indian Institute of Crop Processing Technology (IICPT) celebrated this significant day on the 27th September, 2016. To make day as remarkable, all the staff members of IICPT including Director, Faculty members, Teaching and Non Teaching staff members, Senior Research Fellow and UG, PG and PhD students of IICPT were signed in Hindi. Different literally competitions in Hindi like Poem recitation, Debate competition, Elocution and Singing competition were held at TDC Hall, Dr. V. Subramnayam Block of IICPT. This occasion was graced by the presence of Dr. B.K. Yadav, HOD and Associate Professor of IICPT. The faculty members and students attended the function. The students participated with great fervour. Dr. Yadav highlighted the importance of Hindi in the country in his special address. He also encouraged the students to speak in Hindi and appreciated the students for their commendable performance. Er. Sunil C.K. and Dr. Asish Rawson, Assistant Professor, IICPT appointed as judges of the various competitions. Dr. Akash Pare, Hindi Liasinong Officer, gave vote of Thanks.

PUBLICATIONS

12

Book

Anandharamakrishnan, C. 2017. Handbook of drying for dairy products. Wiley-Blackwell, ISBN: 978-1-118-93049-6.

Book Chapters

- Aadinath, Triroopa Ghosh, P. Heartwin Amaladhas and C. Anandharamakrishnan. 2017 Dried dairy products: Applications and Trends in Global market. Handbook of Drying for Dairy Products, Chapter 2, (Eds.) C. Anandharamakrishnan, Wiley Blackwell. pp 15-22. ISBN: 978-1-118-93049-6.
- Akash Pare and Sunil C K. 2016 Control and safety measures in food dryers. Drying technologies of foods: Fundamentals and applications. Vol 2, (Eds) Prabhat K. Nema, Barjinder Pal Kaur, and Arun S. Mujumdar. New India Publishing Agency. 205-224.
- Anandharamakrishnan, C. 2017. Introduction to drying. Handbook of Drying for Dairy Products, Chapter 1, (Eds) C. Anandharamakrishnan, Wiley Blackwell pp 1-14, ISBN: 978-1-118-93049-6.
- Anu Bhushani and C. Anandharamakrishnan. 2017. Freeze drying. Handbook of Drying for Dairy Products, Chapter 6, (Eds.) C. Anandharamakrishnan, Wiley Blackwell. pp 95-122. ISBN: 978-1-118-93049-6.
- Anu Bhushani, C Anandharamakrishnan. 2017. Food-Grade Nanoemulsions for Protection and Delivery of Nutrients, Nanoscience in Food and Agriculture 4. (eds.) Shivendu Ranjan, Nandita Dasgupta, Eric Lichtfouse, Springer International Publishing. pp 99-139.
- Anu Bhushani, Udayakumar Harish, and C. Anandharamakrishnan. 2016. Nanodelivery of nutrients for improved bioavailability. Nanotechnology in the Agri-Food Industry – Nutrition Delivery, Chapter 10, (Eds.) Alexandru Grumezescu, Elsevier Publications, pp.369-411.
- Gimbun, J., W. P. Law and C. Anandharamakrishnan. 2017. Computational fluid dynamics modelling of the dairy drying processes. Handbook of Drying for Dairy Products, Chapter 9, (Eds.) C. Anandharamakrishnan, Wiley Blackwell. pp 179-202. ISBN: 978-1-118-93049-6.
- Gopirajah, R. and C. Anandharamakrishnan. 2017. Packaging of Dried Dairy Products. Handbook of Drying for Dairy Products, Chapter 11, (Eds.) C. Anandharamakrishnan, Wiley Blackwell pp 229 – 248. ISBN: 978-1-118-93049-6.
- Ishita Roy, Anu Bhushani and C. Anandharamakrishnan. 2017. Techniques for Preconcentration of Milk. Handbook of Drying for Dairy Products, Chapter 3, (Eds.) C. Anandharamakrishnan, Wiley Blackwell pp 23-42. ISBN: 978-1-118-93049-6.
- Karthik, P., Chhanwal Narayansing and C. Anandharamakrishnan. 2017. Drum drying. Handbook of Drying for Dairy Products, Chapter 4, (Eds.) C. Anandharamakrishnan, Wiley Blackwell. pp 43-56. ISBN: 978-1-118-93049-6
- Mahendran, R., Ajay Vino, S., Anandakumar, S., 2016. Fundamentals of computer vision system for sorting and grading of food products. Module in Food Sciences. Elsevier, pp. 1–15.
- Mahendran, R., C. V. Kavitha Abirami and K. Alagusundaram. 2016. Cold Plasma – An emerging non-thermal food processing technology. Apple Academic Press. Part I, Chapter 2 .
- Moses, J. A., Rajauria, G., & Tiwari, B. K. 2017. Effect of Ultrasound on Anthocyanins. Ultrasound in Food Processing: Recent Advances, 485-505.
- Padma Ishwarya, S., and C. Anandharamakrishnan. 2017. Spray drying. Handbook of Drying for Dairy Products, Chapter 5, (Eds.) C. Anandharamakrishnan, Wiley Blackwell pp 57- 94. ISBN: 978-1-118-93049-6.

- Padma Ishwarya, S., C. Anandharamakrishnan and Andrew G.F. Stapley. 2017. Spray Freeze Drying. Handbook of Drying for Dairy Products, Chapter 7, (Eds.) C. Anandharamakrishnan, Wiley Blackwell. pp 123 -148. ISBN: 978-1-118-93049-6.
- Parthasarathi, S. and C. Anandharamakrishnan. 2017. Optimization of Dairy Products' Drying Processes. Handbook of Drying for Dairy Products, Chapter 8, (Eds.) C. Anandharamakrishnan, Wiley Blackwell. pp 149- 178. ISBN: 978-1-118-93049-6.
- Sunil, C. K., Ashish Rawson, D.V. Chidanand and Akash Pare. 2017. Application of emerging technologies for freezing and thawing of foods. Food Process Engineering, Vol. 5, (Eds.) Murlidhar Meghwal and Megh R Goyal. Publisher- Apple Academic Press. 47-77.

Research Papers

- Aadinath, W., Bhushani, A. and Anandharamakrishnan, C. 2016. Synergistic radical scavenging potency of curcumin- in- β -cyclodextrin-in-nanomagnetoliposomes. *Materials Science and Engineering: C*. 64: 293-302.
- Alice R.P. Sujeetha J, Moses. J.A, Loganathan, M. and Meenatchi. R. 2016. Hermetic storage for turmeric rhizomes. *Advances in Life Sciences*. 5(8): 3174-3178.
- Anandakumar S, S. Shubhashini, K. Alagusundaram, C.V. Kavitha Abirami. 2016. Effect of ozone fumigation on *Lasioderma Serricornis* (F.), and quality of turmeric Rhizome, *Journal of Grain Storage Research* 1: 127-12.
- Arya, KS, Yadav, B.K. and Santhakumaran, A. 2016. Effect of temperature and Ozone treatment on the respiration of oyster mushroom. *International Journal of Agriculture, Science and Research*. 6(3):377-388.
- Arya, KS, Yadav, B.K., Santhakumaran, A, Venkatachopathy, N. and Singaravadi, K. 2016. Effect of temperature on the respiration of milky mushroom. *International Journal of Science Environment and Technology*, 5(4):2161-2168.
- Aryakrishnan S and Sinija V R 2016. Proximate composition and antioxidant activity of banana blossom of two different cultivars in India. *International Journal of Agriculture and Food Science Technology*. 7(10):13-22.
- Bhushani, J. A., Karthik, P. and Anandharamakrishnan, C. 2016. Nanoemulsion based delivery system for improved bioaccessibility and Caco-2 cell monolayer permeability of green tea catechins. *Food Hydrocolloids*, 56, 372-382.
- Bhushani, J. A., Kurrey, N. K. and Anandharamakrishnan, C. 2017. Nanoencapsulation of green tea catechins by electrospraying technique and its effect on controlled release and in-vitro permeability. *Journal of Food Engineering*, 199: 82-92.
- Brimapureswaran, R., G. Nivas, R. Meenatchi, Alice R.P. Sujeetha. J and M. Loganathan. 2016. Development of a new solar light cum glue trap model and its utilization in agriculture, *International Journal of Emerging Technology and Innovative Engineering*, 2(3), 2394 – 6598.
- Chidanand D V and S. Shanmugasundaram. 2016. A study on storage temperature of paddy in metal silos. *International Journal of Agricultural Science and Research*. 6(2): 73-78.
- Chidanand DV, Srinivasan K, Shanmugasundaram S, Alice RP Sujeetha J. 2016. Chemical changes of paddy during metal silo storage. *Asian J Pharm Clin Res*. 9(1): 121-125.
- Darsana K. , Yuvraj K.B. and Sinija V.R. 2016. Effect of aril browning on physico-chemical properties of pomegranate. *International Journal of Science, Environment and Technology*. 5(3): 1116-1126.
- Dronachari, M., Yadav, B.K. and Vijay M. 2016. Effect of Different Moisture Content on Physical Properties of Bangalore Red Gram-2 (Brg-2) Variety for Designing of Post Harvest Equipment. *Advances in Life Sciences*, 5(9):1343-1350.
- Dronachari, M., Yadav, B.K. and Vijay M. 2016. Effect of Microwave Drying on Quality Parameters of Bangalore Red Gram-2 Variety. *Advances in Life Sciences*, 5(9):3739-3743.
- Ezhilarasi, P. N., Muthukumar, S. P. and Anandharamakrishnan, C. 2016. Solid lipid nanoparticle enhances bioavailability of hydroxycitric acid compared to a microparticle delivery system. *RSC Advances*, 6(59): 53784-53793.
- Gaikwad Pratik S, Koli Janhavi P. and Akash Pare. 2016. Impact of various drying techniques to reduce oil absorption in black gram papad. *International Journal of Science, Environment and Technology*. 5(3): 1630 – 1637.
- Gopa Das, Raj Pathania and Goutam Das. 2016. Assessment of Dietary Pattern of Adolescents in Himachal Pradesh of India. *Journal of Paramedical Sciences*. 7(3): 1-7.
- Gopirajah, R. and Anandharamakrishnan, C. 2016. Advancement of Imaging and Modeling Techniques for Understanding Gastric Physical Forces on Food. *Food Engineering Reviews*, 8(3): 323-335.
- Gopirajah, R., Raichurkar, K. P., Wadhwa, R. and Anandharamakrishnan, C. 2016. The glycemic response to fibre rich foods and their relationship with gastric emptying and motor functions: an MRI study. *Food & Function*, 7(9): 3964-3972.

- Goutam Das and D. K. Jain. 2016. Economic Analysis of Bullock Marketing in the State Level Organised Cattle Fairs of Rajasthan. *Indian Journal of Agricultural Marketing*. 30(1): 29-39.
- Goutam Das, D. K. Jain and Arun Pandit. 2016. Prioritization of Constraints Faced by Different Marketing Functionaries in the Organised Cattle Fairs of Rajasthan. *Asian Journal of Dairy and Food Research*. 35(1):33-36.
- Jha, P., Chevallier, S., Cheio, J., Rawson, A., Lebail, A. 2017. Impact of resting time between mixing and shaping on the dough porosity and final cell distribution in sandwich bread. *Journal of Food Engineering*. 194: 15-23.
- Karthik, P. and Anandharamakrishnan, C. 2016. Enhancing omega-3 fatty acids nanoemulsion stability and in-vitro digestibility through emulsifiers. *Journal of Food Engineering*, 187: 92-105.
- Karthik, P. and Anandharamakrishnan, C. 2016. Fabrication of a nutrient delivery system of docosahexaenoic acid nanoemulsions via high energy techniques. *RSC Advances*, 6(5): 3501-3513.
- Karthika Devi, B., S. P Kuriakose, A.V.C. Krishnan, P Choudhary, A Rawson. 2016. Utilization of By-product from Tomato Processing Industry for the Development of New Product. *Journal of Food Processing and Technology*. 7(7): 1-8.
- Krishnakumar. T, Rawson, A., Sheriff. J.T, Sajeew, M. S., Thamilselvi. C. 2016. Optimization of ultrasound - assisted extraction of starch from Cassava by response surface methodology. In International Conference on Emerging Technologies in Agricultural and Food Engineering at IIT Kharagpur from 27-30 December, 2016.
- L.L. Michael Khoveio, D.K. Jain and Goutam Das. 2016. A Study on Marketed Surplus and Disposal Pattern of Milk in the North-Eastern State of Nagaland. *Indian Journal of Dairy Science*. 69(1): 94-97.
- Mahendran R., Kalaiselvan Ratish Ramanan, Ravichandran Sargunam, Ravi Sarumathi. 2016. Effect of cold plasma on mortality of *Tribolium castaneum* on maida flour. *Scientific Journal of Agricultural Engineering*. 3: 37-44.
- Monisha S, Niveditha A, Pavithra D, Chidanand D V, Sunil C K and Ashish Rawson. 2016. Effect of Microwave Treatment On Colour Of Turmeric (*Curcuma Longa L.*). *International Journal of Science, and Technology*, 5(4):2062-2070.
- Nagaraja, K, C. K. Sunil, D. V. Chidanand and M. Ramachandra. 2016. Drying Kinetics of Fig (*Ficus carica L*) under Various Drying Methods. *Journal of Agricultural Engineering*. 53 (4): 42-50.
- Nivas,G., Alice R.P. Sujeetha,J, R. Meenatchi, R. Brimapureswaran and M.Loganathan. 2016. Evaluation of an improved electronic grain trap model in stored grains. *International Journal of Emerging Technology and Innovative Engineering*, 2(2):74-78.
- Parthasarathi, S. and Anandharamakrishnan, C. 2016. Enhancement of oral bioavailability of vitamin E by spray-freeze drying of whey protein microcapsules. *Food and Bioproducts Processing*, 100: 469-476.
- Parthasarathi, S., Muthukumar, S. P. and Anandharamakrishnan, C. 2016. The influence of droplet size on the stability, in vivo digestion, and oral bioavailability of vitamin E emulsions. *Food & function*, 7(5) 2294-2302.
- Ragava S C, Loganathan M, Vidhyalakshmi R and Vimalin HJ. 2016. Microbial evaluation and control of microbes in commercially available date (*Phoenix dactylifera* Lynn.) fruits. *Journal of Food Processing & Technology*, 7(7): 1000598.
- Suffo Kamela, A. L., Mouokeu, R. S., Rawson, A., Maffo Tazoho, G., Moh, L. G., Pamo, E. T., Kuate, J-R. 2016. Influence of processing methods on proximate composition and dieting of two *Amaranthus* species from West Cameroon. *International Journal of Food Science*, 1-8.
- Sulochana, S., Meyyappan, R.M. and Singaravadevel K. 2016. Mass spectrometry analysis of indian traditional variety "Red Kavuni" in comparison with high yielding popular variety of Tamil Nadu ADT 43 under raw and hydrothermally processed condition. *Indo Ame. J. of Pharmaceutical Research*. 6(5):5358-5363.
- Sulochana, S., Meyyappan, R.M. and Singaravadevel K. 2016. Phytochemical screening and GC-MS analysis of *Garudan samba* traditional rice variety. *Int J Environmental & Agrl. Res.*, 2(4):44-47.
- Sunil, C. K., Venkatachalapathy, N., Shanmugasundaram, S., Akash Pare and Loganathan, M. Engineering Properties of Foxtail Millet (*Setaria italic*): Variety- HMT 1001. *International Journal of Science, Environment and Technology*, 5(2): 2016.
- Sureshkumar, K., B. Hariharan and R. Vidyalakshmi. 2016. Microbiological Quality of Fresh Cut Fruit Salad Sold in Thanjavur City. *Journal of Pure and Applied Microbiology*. 10(2): 1081-1087.
- Sureshkumar, K., Nathira Fathima, P.Rajendran and R.Vidyalakshmi. 2016. Effect of Storage Temperature on Exopolysaccharide Yields and Stability in *Bacillus subtilis* (MTCC 121) using Grapes. *Int.J.Curr.Microbiol.App.Sci*. 5(4): 15-20.
- Veena, T, Yadav, B.K, and Alagusundaram K. 2016. Study the suitability of continuous hydrothermal pretreatment on the dehulling of red gram (*Cajanus cajan*. L). *Eco. Env. & Cons*. 22 (3) :371-374.
- Vimala, B.S.K., Vishnu P. V., Vishnu, E. & Moses, J.A. 2016. Insect infestation and losses in stored food grains. *Ecology, Environment and Conversation*. 23(1): 287-292.

- Vithu, P., & Moses, J. A. (2016). Machine vision system for food grain quality evaluation: A review. *Trends in Food Science & Technology*, 56, 13-20.
- Vivek K, Pratibha Singh and Sasikumar. 2016. Optimization of iron rich extruded *Moringa oleifera* snack product for anaemic people using Response Surface Methodology (RSM). *J Food Process Technol.* 7: 639.

Abstracts in seminars/workshops/conferences

- Abinaya,E., M.Loganathan, S. Sivaramakrishnan and J.Alice R P Sujeetha. 2016. Deterrent effect of some medicinal plants against t. castaneum in wheat flour. In: National Seminar on Recent Trends in Postharvest Pest Management held at IICPT on 4.11.2016. p.53.
- Abinaya.A., Ahana.E. and Yadav.B.K. 2016. Extension of shelf life of dehulled mung bean by using turmeric powder as biopesticides. In: National Seminar on Recent trends in post harvest pest management held at IICPT, Thanjavur on 04 Nov 2016. pp 47.
- Abirami C.V.K., Moses J.A., Joshi J. 2016. Management protocols for temperature control in bulk paddy in a pilot scale flat bottom bin under Indian conditions. In: 10th International Conference on Controlled Atmosphere and Fumigation in Stored Products held at New Delhi from 6-11 November 2016. p. 152.
- Ajay V.S., Moses J.A., Anandharamakrishnan C. 2016. A Computational Modelling Approach for Determination of Slowest Heating Point in Canned Liquid Foods. In: Proceedings of Challenges and Opportunities in Food packaging held at IICPT, Thanjavur on 23 September 2016.
- Ajay V.S., Moses J.A., C. Anandharamakrishnan. 2017. A Computational Modelling Approach for Determination of Slowest Heating Point in Canned Liquid Foods. In: National seminar on Challenges and Opportunities in Food Packaging on 23rd Sep 2016, at Indian Institute of Crop Processing Technology (IICPT), Thanjavur, Tamil Nadu. p.173.
- Alice J.R.P. Sujeetha, Loganathan M., Moses J.A. and Meenatchi R. 2016. Advances in grain storage and pest management in India. In BIT's 4th Annual Global Health Conference-2016 held at Kaohsiung, Taiwan from 18-20.11.2016. p. 346.
- Anandakumar S, G Madhumathi, K Alagusundaram, C V Kavitha abirami, R P Sujeetha Alice and Munendra singh. 2016. Effect of PVC coated fabric cover on quality of paddy (oryza sativa) during cover and plinth (cap) storage. In: 10th International conference on Controlled atmosphere and fumigation in stored products , 6-11 November 2016, New Delhi. p.495-500.
- Anandakumar S, Ranjit Singh, Alagusundaram,K, Kavitha Abirami CV and J. Alice R.P. Sujeetha. 2016. Effect of ozone fumigation on controlling drugstore beetle and quality of coriander during Storage. In: 10th International conference on controlled atmosphere and fumigation in stored products , 6-11 November 2016, New Delhi. p.53-58.
- Anandakumar, S., S U.Kandhanamiltha, S.Kasirasu, A. Kavippriyaa and K.Keerthana 2016. Development of quick ripening cum cold storage system for G9 banana. In: National conference on emerging trends in food processing and quality assurance (Foodomics'16) on April 12 and 13, 2016.
- Arya K.S, Yadav, B.K. 2016. Design of MAP for extending shelf-life of ozone treated fresh oyster mushroom. Published in the proceeding of the National seminar on Challenges and Opportunities in Food Packaging on 23 Sep 2016 organized by IICPT, Thanjavur. pp 154-159.
- Banuu Priya E P and Sinija V R. 2016. Safe storage guidelines for small onion under modified bulk storage system. In: Proceedings in 10th International Conference on Controlled Atmosphere and Fumigation in stored products organized at New Delhi from 6-11 Nov 2016. p.162
- Bharath K.S., Raghavi L.M. and Moses J.A. 2016. Edible Composite Coating of Fresh-Cut Potato Cubes for Improved Storage Quality. In: Proceedings of Challenges and Opportunities in Food packaging held at IICPT, Thanjavur on 23 September 2016.
- Bhuvaneshwari, M., J. Anu Bhushani, GS. Joseph and C. Anandharamakrishnan. 2017. Effect of surfactant concentration of oxidative and digestive stability of flax oil nanoemulsions. In: 85th Annual meeting of the Society of Biological Chemists, India (SBCI) -2016 organized at CSIR-CFTRI, Mysore during 21st-24th Nov 2016. pp.218.
- Chandrika, GM., S. Padma Ishwarya, GS. Joseph, V. Arun Kumar and C. Anandharamakrishnan. 2017. Effect of Ocimum basilicum based nanocomposite coating for shelf life extension of fresh fruits and vegetables. In: 85th Annual meeting of the Society of Biological Chemists, India (SBCI)-2016 organized at CSIR-CFTRI, Mysore during 21st-24th Nov 2016. pp.167
- Deepaveni, S., N.Rajeswari, S.Anandakumar. 2016. Effect of Packaging Materials and MAP on Quality of Meat National Conference on Emerging trends in Food Processing and Quality Assurance (Foodomics'16) on April 12 and 13, 2016. p.522-532.

- Devipriya K.S., Dharani A., Gokulkumar N., Moses J.A. and Anandharamakrishnan C. 2016. Application of Fick's Law to Predict CO₂ Fumigant Diffusion in Grain Storage Systems Using Finite Element Analysis. In National Seminar on Recent Trends in Postharvest Pest Management held at IICPT, Thanjavur on 04.11.2016.
- Devipriya K.S., Dharani A., Gokulkumar N., Moses J.A., Anandharamakrishnan C. 2016. 2-D Simulation Studies on the Effect of Nanocomposites Configurations on the Diffusion Patterns of Permeates Through Polymeric Films. In: Proceedings of Challenges and Opportunities in Food packaging held at IICPT, Thanjavur on 23 September 2016.
- Devipriya, K.S., A. Dharani, N. Gokulkumar, J.A Moses and C. Anandharamakrishnan. 2017. Application of Fick's Law to predict CO₂ fumigant diffusion in grain storage systems using finite element analysis. In: National seminar on Recent Trends in Postharvest Pest management on 4th November 2016 at Indian Institute of Crop Processing Technology (IICPT), Thanjavur, Tamil Nadu.
- Devipriya, K.S., A. Dharani, N. Gokulkumar, J.A Moses and C. Anandharamakrishnan. 2017. 2-D Simulation Studies on the Effect of Nanocomposites Configurations on the Diffusion Patterns of Permeates Through Polymeric Films. In: National seminar on Challenges and Opportunities in Food Packaging on 23rd Sep 2016 at Indian Institute of Crop Processing Technology (IICPT), Thanjavur, Tamil Nadu. p.174.
- J. Alice R.P.Sujeetha, M.Loganathan, J.A.Moses and R.Meenatchi. 2016. Advances in grain storage and pest management in India. In: BIT's 4th Annual Global Health Conference-2016, Kaohsiung, Taiwan, November 18-20, 2016. P.346.
- Jha, P.,A Le-Bail, S Chevallier, A Rawson, J. Cheio (2016). Impact of processing operations on dough aeration during mixing, rest, shaping and fermentation; influence on bread structure. In: EFOST Annual Meeting 2016, Austria from 10 – 12 November 2016. pp.12-15
- Kumari, P. V., Mohan, R. J., Sandeep, Rawson, A. 2016. Comparison of phytochemicals and antioxidant properties of different parts of Jackfruit *Artocarpus Heterophyllus* species. Presented in 48th ANNUAL NATIONAL CONFERENCE OF NUTRITION SOCIETY OF INDIA on 4th & 5th November 2016 at Bangalore.
- Kumari, P. V., Mohan, R. J., Sandeep, Rawson, A. 2016. Quality Evaluation of Jack Fruit flour and Formulation of Convenience Food. In: international conference on Food, Nutrition and Health (ICFNH 2016) organized Indian Dietetic Association, Kilakarai Chapter and Departement of Food and Nutrition Research Center Thassim Beevi abdul Kader College for Women. 6-8 June 2016.
- Mahendran, R. 2016. Effect of cold plasma on mortality of *Tribolium castaneum* in 10th international conference on Controlled Atmosphere Fumigation (CAF-2016) at Delhi during 6-11, Nov, 2016. p.142.
- Mahendran, R., G. Nivas, K. Ratish Ramanan. 2016. Innovative novel non-thermal fumigation system for stored whole grains in National seminar on Recent trends in Postharvest pest management on 4th Nov, 2016 at IICPT. p.49.
- Meenatchi R, Brimapureswaran R, Alagusundaram K, Sujeetha RPJA, Loganathan M. 2016. Use of carbon dioxide (CO₂) and phosphine (PH₃) for management of major stored-product insects of paddy *Oryza sativa* (L.). In: Proceedings of the 10th International Conference on Controlled Atmosphere and Fumigation in Stored Products (CAF2016), Navarro S, Jayas DS, Alagusundaram K, (Eds.) CAF Permanent Committee Secretariat, Winnipeg, Canada.pp.153-156.
- Mohan Naik, G., P. Vasantha Kumari, R. Jaganmohan, Sandeep Janghu & Ashish Rawson 2017. Production Technology of Jackfruit Flour as a Functional Ingredient. In: National Seminar on Trends and Innovation in Food Processing Technology: Prospects & Challenges. Organized by Department of Food Engineering & Technology, Tezpur University, Sonitpur, Assam, INDIA from 9th - 10th February 2017. p. 34.
- Mohan Naik, Vasantha Kumari, Sandeep Janghu, Ashish Rawson, Jaganmohan R. (2017). Production technology of jackfruit flour as a functional ingredient", at a National seminar on "Trends and Innovation in Food Processing Technology: Prospects and Challenges" 9th -10th February, 2017, held at Tezpur University, Tezpur, Assam.
- Mohana Y., Mohana Priya R., Moses J.A. Technology package for extended storage of desiccated coconut. In: Genochem 2K16 – a national level technical symposium held at Arulmigu Meenakshi Amman College of Engineering on 01.10.2016. (Best Paper Award).
- Monisha Choudhury, Ankita Majumdar and Sandeep Janghu. 2016. Development and Acceptance Analysis of Mixed Fruit Pomace Fortified High-Fiber Biscuit. IRF International Conference on Agriculture and Biotechnology. At Chennai, Tamil Nadu, India from 29th – 30th October 2016. pp. 1-5.
- Moses J.A. 2016. Three-dimensional phosphine distribution patterns in cylindrical structures filled with grain. In: 10th International Conference on Controlled Atmosphere and Fumigation in Stored Products held at New Delhi from 6-11 November 2016. p. 107.

- Moses J.A., Vishnu P., Alice J.R.P. Sujeetha, Loganathan M., Tiroutchelvame D. 2016. Hermetic storage of coriander (*Coriandrum sativum*) seeds. In: 10th International Conference on Controlled Atmosphere and Fumigation in Stored Products held at New Delhi from 6-11 November 2016. p. 89.
- Moses JA. 2016. Three-dimensional phosphine distribution patterns in cylindrical structures filled with grain. In: 10th International Conference on Controlled Atmosphere and Fumigation at Conference Secretariat, New Delhi during 07 to 11 November 2016.
- Moses, J.A., P Vishnu, Sujeetha R P J Alice and M Loganatha and D Tiroutchelvame. 2016. Hermetic storage of coriander (*Coriandrum sativum*) seeds. In: Abstracts of the 10th International Conference on Controlled Atmosphere and Fumigation in Stored Products, 6-11 November 2016, New Delhi, India. *Published by CAF Permanent Committee Secretariat Winnipeg, Canada.* P.89.
- Nivas, G. P. Paulin Patricia, J. Alice R. P. Sujeetha, R. Meenatchi and M. Loganathan, 2016. Improved Electronic grain probe trap for the detection of pests in stored grains. In: National Seminar on Recent trends in postharvest pest management held at IICPT on 4.11.2016. p. 33.
- Nivas, G., M. Suryan, R. Mahendran, N. Venkatachalapathy. 2016. Novel pelleting technique for grain storage handling and pest control in National seminar on Recent trends in Postharvest pest management on 4th Nov, 2016 at IICPT. p.50.
- Nivas, G., R Brimasureswaren, J Alice R Meenatchi and M Loganathan. 2016. Improved electronic grain probe trap for the detection of pests in stored grains. In: Abstracts of the 10th International Conference on Controlled Atmosphere and Fumigation in Stored Products, 6-11 November 2016, New Delhi, India. *Published by CAF Permanent Committee Secretariat Winnipeg, Canada.* P. 109.
- Nivetha, D, Yadav, B.K. 2016. Development of cellulose based packaging film by substituting natural cellulose with extracted sugarcane bagasse cellulose. Published in the proceeding of the National seminar on Challenges and Opportunities in Food Packaging on 23 Sep 2016 organized by IICPT, Thanjavur. pp 34-44.
- Parthasarathi, S., GS. Joseph, and C. Anandharamakrishnan. 2017. Computational modeling of peristaltic flow and nutrient absorption in the small intestine. In: 85th Annual meeting of the Society of Biological Chemists, India (SBCI) -2016 organized at CSIR-CFTRI, Mysore during 21st-24th Nov 2016. pp.165
- Pavankumar, H., S. Padma Iswarya, Gs. Joseph and C. Anandharamakrishnan. 2016. "Development and characterization of nanofood particles. In: 85th Annual meeting of the Society of Biological Chemists, India (SBCI) -2016 organized at CSIR-CFTRI, Mysore during 21st-24th Nov 2016.
- Raghavi L.M., Bharath K.S., Vithu P. and Moses J.A. 2016. Non-destructive Identification of Infested Paddy Using E-vision. In National Seminar on Recent Trends in Postharvest Pest Management held at IICPT, Thanjavur on 04.11.2016 (2nd Prize).
- Rajalakshmi, E., Sajag Ved, V R Sinija. 2016. Shelf life extension of tomato by ultrasound and UV pretreatments. Paper presented at one day National Seminar on Challenges and Opportunities in Food Packaging organized at IICPT Thanjavur on 23 September 2016. p.178.
- Ramya, P., G. Sathishkumar, M. Loganathan and G.Sridharan. 2016. Development of life stages of red flour beetle, *Tribolium castaneum* in various processed grains and in various processed foods. In: National Seminar on Recent Trends in Postharvest Pest Management held at IICPT on 4.11.2016. p.56.
- Ratish Ramanan, K., R. Sarumathi, R. Mahendran. Influence of O₂-N₂ plasma on mortality rate of different life stages of *Tribolium castaneum* on refined wheat flour in National seminar on Recent trends in Postharvest pest management on 4th Nov, 2016 at IICPT. p.48.
- Revathi S, N., Sivakumaran and Sinija V. R. 2016. Intelligent controller based forced ventilation for greenhouse using speed control of dc motor. In: International Conference on Emerging Techniques in Agricultural and Food Engineering, EATE 2016 organized by IIT Kharagpur on 27-30 Dec 2016. p.98.
- Rufina Mathew, Dorothy Jaganathan and S Anandakumar. 2016. Effect of vacuum packaging on shelf life of chicken. In: National Seminar on Challenges and opportunities in food packaging organized at IICPT on 23 Sep 2016. pp 160-164.
- Sadhana, R., Rohit Anand and S Anandakumar (2016) Effect of packaging materials on quality of moringa (*Moringa oleifera*) leaves during storage. In: National seminar on challenges and opportunities in food packaging organized at IICPT on 23 Sep 2016 pp 84-89.
- Sandeep Janghu, Manab B. Bera & Ashish Rawson. 2016. Power Ultrasound Process Optimization of Raw Honey. In: First International Conference on Food, Nutrition and Health (ICFNH-2016). At Madhurai, Tamil Nadu, India from 6th- 9th June 2016. p. 100.

- Sandeep Janghu, Manab B. Bera, R. Jagan Mohan and K. Srinivasan 2017. Dynamic Headspace Analysis of Volatile Compounds in Indian Honey Varieties. In: National Seminar on Trends and Innovation in Food Processing Technology: Prospects & Challenges. Organized by Department of Food Engineering & Technology, Tezpur University, Sonitpur, Assam, India from 9th- 10th February 2017. p. 44.
- Sanjana P, Santhosh R, Sangeetha K, R Mahendran. Effect of Microwave Heating on Red Flour Beetle *tribolium castaneum*. In: National seminar on Whole grain for Healthy life on 16th October, 2016.
- Sanjana P, Santhosh R, Sangeetha K, R. Mahendran. Effect of Cold Plasma on Soaking Characteristic of *Bambusa Arundinacea* in National Level Technical Symposium on 1st October 2016 at Arulmigu Meenakshi Amman College of Engineering.
- Sanjana P, Santhosh R, Sangeetha K, R. Mahendran. Fermentation of cocoa beans and Its Quality parameters in National Conference on Current Trends in Quality Indices on 7th & 8th October 2016 at Karunya Institute of Technology and science. p.25.
- Sanjana P, Santhosh R, Sangeetha K, R. Mahendran.2016. RSM to investigate the Effect of In Pack Cold plasma processing on Color, Texture, Water activity of Exposed Bread Slices in National seminar on Challenges and opportunities in Food packaging on 23rd September 2016 at IICPT. p.174
- Shanmathi, S., G.R.Shalini, Shreyansh Raj Morris, and Dr. V.R.Sinija (2016) Low cost ultrasound treatment system for liquid foods. In:International Conference on Emerging Techniques in Agricultural and Food Engineering, EATE 2016 organized by IIT Kharagpur on 27-30 Dec 2016. P.258
- Shreyansh Raj Morris, S. Shanmathi, G.R.Shalini, and Dr. V.R.Sinija. 2016. Study on impact of high frequency sound waves on curd fermentation. In: National Seminar Organized by Karunya University, Coimbatore, on 6-7 October 2016.
- Sinija V R, Banuu Priya E P, Alice R P Sujeetha, Shanmugasundaram and Loganathan M. 2016. Modified Atmosphere Packaging for Bulk Storage of Onion through Diffusion Channel System, Invited paper for BIT's 5th Annual World Congress on Food & Nutrition 2016 to be held at Taiwan on 18-20 Nov 2016. p.345.
- Sinija V R, Karthickumar P, Darsana K and Yuvraj K B and Yadav B K. 2016. Non-destructive detection of internal quality of selected fruits and vegetables using acoustic resonance technique. In: International Conference on Emerging Technologies in Agricultural and Food Engineering to be held at IIT Kharagpur on 27-30 Dec 2016.
- Sirppa.S, Sivabalan.K, Sivaranjani.S, Pratibha Singh, 2016. Phase Change Material Integrated Dryer Using Renewable Energy. In: National Symposium on engineering applications to solve human problems on shelter, food, water, energy & health on 5th October 2016 at Karunya University.
- Sirppa.S, Sivabalan.K, Sivaranjani.S, Pratibha Singh, 2016. Shelf life study on minimally processed vacuum packed spinach. In: National Seminar on Challenges and Opportunities in Food Packaging on 23rd September 2016 at IICPT.
- Sivakama Sundari, S.K, and C. Anandharamakrishnan. 2017. Antibacterial activity of curcumin incorporated chitosan-silver nanocomposite films. In: National seminar on Challenges and Opportunities in Food Packaging on 23rd Sep 2016 at Indian Institute of Crop Processing Technology (IICPT), Thanjavur, Tamil Nadu. p.169.
- Sivakama Sundari, S.K., J.A Moses and C. Anandharamakrishnan.2017. Computational Fluid Dynamics Modeling of Heat Transfer in Canned Peas During Thermal Processing. In: ICFoST-XXV organized by AFST(I)-HQ and Amritsar Chapter at Guru Nanak Dev University (GNDU), Amritsar, Punjab during 10th-12th Nov 2016. p.85.
- Sujeetha R P J Alice, C Bala Kumaran, M Loganathan, R Meenatchi. 2016. Entomopathogenic fungi— a potential biopesticide against storage pests In: Abstracts of the 10th International Conference on Controlled Atmosphere and Fumigation in Stored Products, 6-11 November 2016, New Delhi, India. Published by CAF Permanent Committee Secretariat Winnipeg, Canada. P. 141
- Vanmathi, R. Meenatchi, M. Loganathan and Alice R. P. Sujeetha, 2016. Studies on the effect of phosphine fumigation on germination and microbial infestation in paddy. In: National Seminar on Recent trends in postharvest pest management held at IICPT on 4.11.2016. p.25.
- Vasanth Kumari, P., R. Jagan Mohan, Sandeep and Ashish Rawson. 2016. Quality Evaluation of Jackfruit Flour & Formulation of Conventional Food. First International Conference on Food, Nutrition and Health (ICFNH-2016). At Madhurai, Tamil Nadu, India from 6th- 9th June 2016. pp. 104-105.
- Vasanth Kumari, P., R. Jagan Mohan, Sandeep and Ashish Rawson. 2016. Comparison of Phytochemicals and Antioxidant Properties of Different Parts of Jackfruit *Artocarpus heterophyllus* species. In: 48th Annual National Conference of the Nutrition Society of India. Theme: Nutrition Risk Management and Communication. At Bangaluru, Karnataka, India from 4th – 5th November 2016. pp. 200-201.

Vishnu P, Moses JA, Alice JRPS, Loganathan M, Tiruchelovmae T. 2016. Hermetic storage of turmeric rhizomes. In: 10th International Conference on Controlled Atmosphere and Fumigation at Conference Secretariat, New Delhi during 07 to 11 November 2016.

Popular articles

- Ajay Vino S, Harshita and Sinija V R (2016) Underutilized fruits in India. *Indian Food Industry*. 35(2): 45-47.
- Anandharamakrishnan C and Sulochana S. 2017. Size grading and hydrothermal process of small millets to achieve high milling yield" (*Siru Dhaniyanggalai Tharam Piriththalam Adhai Puzhungal Saidu Adhiga Kandumudhal Kaanudhalum*)". Star Mail 2017. Mookambika Market Reviews, Special issue.p.126-128.
- Bharath K S, Prasad Reddy M N and Sinija V R. 2016. Sous vide cooking: An upscale culinary technique. *Indian Food Industry*. 35(1): 28-30.
- Bharath K.S., Leena M., Moses J.A., Anandharamakrishnan C. 2017. Green synthesis of metal nanoparticles using spices. *Cutting edge*. 6(11): 42-45.
- Bharath K.S., Raghavi L.M. and Moses J.A. 2016. Cold Chain Technology for Perishables. *Food and Beverage News*. 15: 33- 37.
- Bharath, K.S., M. Maria Leena, J.A Moses and C. Anandharamakrishnan, 2017. Green synthesis of Metal Nanoparticles Using Spices. *Spinco Biotech Cutting Edge*, 6(11)
- K Bhosale Yuvraj and V R Sinija. 2017. Potential ultrasound in water treatment. *Beverage and Food world*. 44 (3):40-42.
- Karthickumar P., Moses J.A. 2016. Millets for nutritional security – a critical appraisal. *Processed food industry*. 20 (2): 17-20.
- Mahendran. R. 2016. Nutmeg: Post-harvest processing, potential application. *Food and Beverage News*, March, 2016. 35-36
- Paranthaman, R., R.Vidyalakshmi, K.Sureshkumar and S.Kumaravel. 2017. Traditional cereal fermented food and beverage offerings in India. *Food and Beverage News*, March 1: 63-64
- Paulin Patricia P, Alice R.P. Sujeetha J, Meenatchi R and Loganathan M. 2017. Novel technique for enhancing the shelf-life of fruits and vegetables. *Beverage & Food World*. 44 (5): 41-42
- Rawson, A., Sunil, C. K. 2016. Veterinary Drug Residue, a Food Contaminant. *Ingredients South Asia*, a Saffron Media Publication, 10(4): 164-167.
- Sanjana Potluri and R Mahendran. 2016. TEFF – gluten free, highly nutritious, big super grain of Ethiopia in Food and beverage news, <http://www.fnbnews.com/Top-News/teff--gluten-free-highly-nutritious-big-super-grain-of-ethiopia-39099>.
- Vidyalakshmi, R., R.Paranthaman and S.Kumaravel. 2017. Bioconversion of rice brokens for food grade pigments. *Food and Beverage News*, March 1:59-61
- Vimala Bharathi S K, Vishnu Eswaran, Vishnu Priya V, Moses J.A., Tito A. 2016. Inclined Pneumatic Grain Cleaning System (in Tamil). *Malarum velanmai*. 15(17): 68.
- Vithu, P., Moses, J.A. Carbon-di-oxide sensors for monitoring stored grain quality. *Food and Beverage news*. 16(30): 13-15.

Radio Talk

- Amudhasurabi .2017. Opportunities in Food Processing Sector. AIR, Tiruchirapalli.
- Loganathan M. 2016. Insects in Food Products?. All India Radio, Trchirapalli
- Sulochana S. 2017. Production of Modern Food Products from Traditional Paddy Varieties" (*Parambariya Nellil Naveena Unavu Porutkal Thayarithal*)" All India Radio, Trichy.
- Sulochana S. 2016., Newly developed Red rice Vermicelli product. FM Radio.

BOARD MEMBERS & EC MEMBERS

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BOARD MEMBERS	
Sl.No.	Name and Designation
1.	Shri. Avinash Kumar Srivastava Secretary / Chairman –IICPT Board Ministry of Food Processing Industries Panchsheel Bhavan, August Kranti Marg New Delhi - 110 049
2.	Shri. Rajiv Mishra Economic Advisor Ministry of Food Processing Industries Panchsheel Bhavan, August Kranti Marg New Delhi - 110 049
3.	Sh. Shri Prakash Joint Secretary (Finance) Ministry of Food Processing Industries Panchsheel Bhavan, August Kranti Marg New Delhi - 110 049
4.	Dr. S. Vijayakumar Agricultural Production Commissioner & Principal Secretary – Addl. Charge Department of Agriculture Government of Tamil Nadu Chennai - 600 009
5.	Dr. Ravinder Kaur Director Indian Agricultural Research Institute Pusa, New Delhi - 110 012
6.	Dr. H.S. Gupta (Former Director, IARI, New Delhi) 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

Sl.No.	Name and Designation
8.	Dr. Pitam Chandra Professor, Dept. of Food Engineering National Institute of Food Technology Entrepreneurship and Management (NIFTEM) Plot No. 97, Sector 56, HSIIDC Estate, Kundli, Distt. Sonapat, Haryana - 131 028
9.	Shri. Abishek Abraham Executive Director (Nominated by Sh. Padma Singh Issac, CMD) Aachi Masala Foods (P) Ltd. Plot No.1926 34th Street, Ishwarya Colony I Block, Anna Nagar West, Chennai - 600 040
10.	Shri. V.V. Krishnan Chief Technical Officer (Nominated by Shri. SKM Shree Shivkumar Chief Executive Officer) SKM Egg Products Exports (India) Ltd. 185, Chennimalai Road, Erode - 638001
11.	Shri. Bharat Lal Meena Deputy General Manager (Nominated by Sh. A.S. Arunachalam) Food Corporation of India No.8, Mayor Sathyamoorthy Road Chetput, Chennai - 600 031
12.	Dr. C. Divakar Durairaj Dean Agricultural Engineering College & Research Institute Tamil Nadu Agricultural University Coimbatore - 641 003
13.	Dr. C. Anandharamakrishnan Director Indian Institute of Crop Processing Technology Thanjavur - 613 005

Executive Committee Members

Sl.No.	Name and Designation
1.	Shri. Rajiv Mishra Economic Advisor / Chairman IICPT EC Ministry of Food Processing Industries Panchsheel Bhavan, August Kranti Marg New Delhi - 110 049
2.	Shri. Shri Prakash Joint Secretary (Finance) Ministry of Food Processing Industries Panchsheel Bhavan, August Kranti Marg New Delhi - 110 049
3.	Shri. Ajay Negi Director (Institutions) Ministry of Food Processing Industries Panchsheel Bhavan, August Kranti Marg New Delhi - 110 049
4.	Shri G.V. Viswanath, I.A.S (Retd.) No. 7, Dewan Madhava Rao Road Basavanagudi Bangalore - 560 004
5.	Dr. Saraswathy Eswaran Former Professor of TNAU 29, Vallalar nagar, Vadvalli, Coimbatore - 641 041
6.	Dr. K.K. Singh Director Central Institute of Agricultural Engineering Nabibagh, Berasia Road, Bhopal - 462 038
7.	Dr. C. Anandharamakrishnan Director Indian Institute of Crop Processing Technology Pudukkottai Road, Thanjavur - 613 005

AUDITED STATEMENT 2016-17

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INDIAN INSTITUTE OF FOOD PROCESSING TECHNOLOGY MINISTRY OF FOOD PROCESSING INDUSTRIES, GOVERNMENT OF INDIA PUDUKOTTAI ROAD, THANJAVUR - 613 005, TAMIL NADU IIFPT CONSOLIDATED RECEIPTS AND PAYMENT ACCOUNT FOR THE YEAR ENDED 31.03.2017					
Receipts	Amount (₹)	Amount (₹)	Payments	Amount (₹)	Amount (₹)
TO.,			BY.,		
OPENING BANK BALANCES - (SCH-1)		18,250,379.64			
INCOME			EXPENSES		
IIFPT		76,307,091.45	IIFPT		95,001,753.41
ACADEMIC		25,147,752.00	ACADEMIC		4,904,144.00
SWF		29,433.00	SWF		310.50
STU MERIT		383,453.00	STU MERIT		568,000.00
RCF		3,258,862.00	RCF		714.15
GUWHATI		1,493,002.00	GUWHATI		3,730,972.00
EXTERNAL PROJECT		14,423,542.00	EXTERNAL PROJECT		7,578,173.00
NSS		6,186.00	NSS		62,088.00
TOTAL C/F	-	139,295,701.09	TOTAL C/F	-	111,846,155.06



INDIAN INSTITUTE OF FOOD PROCESSING TECHNOLOGY MINISTRY OF FOOD PROCESSING INDUSTRIES, GOVERNMENT OF INDIA PUDUKOTTAI ROAD, THANJAVUR - 613 005, TAMIL NADU IIFPT CONSOLIDATED RECEIPTS AND PAYMENT ACCOUNT FOR THE YEAR ENDED 31.03.2017					
Receipts		Amount (₹)	Amount (₹)	Payments	
TO..				BY..	
TOTAL B/F			139,295,701.09	TOTAL B/F	
BALANCE SHEET ITEMS				BALANCE SHEET ITEMS	
IIFPT				IIFPT	
CURRENT LIABILITIES				CURRENT LIABILITIES	
TDS PAYABLE - 42005- OTHERS		403,312.00		PROVISION	4,967,597.00
TDS PAYABLE - SALARY		3,833,645.00		TDS PAYABLE - 42005- OTHERS	403,312.00
CAUTION DEPOSIT - 510011 (Old)		72,000.00		TDS PAYABLE - SALARY	3,633,835.00
CAUTION DEPOSIT - 687		748,000.00		APEDA-3	1,960.00
CO-OPTEX - 420013		135,278.00		CAUTION DEPOSIT - 510011	31,000.00
EMD - 510010		372,649.00		CAUTION DEPOSIT - 687	247,000.00
EMD - 687		225,500.00		CO-OPTEX - 420013	135,278.00
EMPLOYEES SUBSCRIPTION - 410023		19,772,448.00		EMD - 510010	227,649.00
FAMILY PROVIDENT FUND - FPF		40.00		EMD - 687	434,000.00
FUNDS RECEIVED FROM EXTERNAL PROJECTS		4,563,524.00		EMPLOYEES SUBSCRIPTION - 410023	18,094,942.00
GPF SUBSCRIPTION		35,120.00		FAMILY PROVIDENT FUND - FPF	40.00
GSLIS - 420014		44,247.00		GPF SUBSCRIPTION	35,120.00
LIC - 420011		1,455,480.00		GSLIS - 420014	44,247.00
NORTH EAST FESTIVAL		123,532.00		LIC - 420011	1,418,601.00
PAYABLE TO ACADEMIC FUND		1,406.00		NORTH EAST FESTIVAL	49,466.00
PAYABLE TO EXTERNAL PROJECT		2,119,587.00		PERFORMANCE SECURITY DEPOSIT	546,376.00
SCOFTECH CLOSURE		209,803.00		REFUND OF MISC-RECEIPTS	2,415.00
SERVICE TAX PAYABLE		967,821.50		SPECIAL BENEFIT FUND - SBF	10.00
SPECIAL BENEFIT FUND - SBF		10.00		TDS SCOFTECH	5,000.00
STALE CHEQUE		31,520.00		TRANSFER FROM OTHER FUNDS	12,307,777.33
TRANSFER FROM OTHER FUNDS		12,307,777.33		TRANSFER FUNDS TO EXTERNAL PROJECT FUND	7,021,202.00
TRANSFER FUNDS TO EXTERNAL FUND (PAYABLE)		248,802.00			49,806,827.33
TRANSFER FUNDS TO EXTERNAL PROJECT FUND		436,350.00			
GRANT IN AID - RC-GUWAHATI		142,100,000.00	190,207,851.83		
			329,503,552.92		161,652,982.39



INDIAN INSTITUTE OF FOOD PROCESSING TECHNOLOGY MINISTRY OF FOOD PROCESSING INDUSTRIES, GOVERNMENT OF INDIA PUDUKOTTAI ROAD, THANJAVUR - 613 005, TAMIL NADU IIFPT CONSOLIDATED RECEIPTS AND PAYMENT ACCOUNT FOR THE YEAR ENDED 31.03.2017						
TO..	TOTAL B/F		329,503,552.92	BY..	TOTAL B/F	161,652,982.39
FIXED ASSETS				FIXED ASSETS		
FOOD LAB CLOSURE	872,928.00			BUILDINGS	490,564.00	
LIBRARY	100.00	873,028.00		EQUIPMENTS	1,137,415.00	
				FURNITURE & FITTINGS	631,089.00	
				COMPUTER, SOFTWARE & NETWORK	282,640.00	
				TOOLS & PLANT	60,609.00	2,602,317.00
CURRENT ASSETS				CURRENT ASSETS		
COMPUTER ADVANCE	23,222.00			COMPUTER ADVANCE	90,000.00	
COMPUTER ADVANCE PRINCIPAL	59,651.00			DEPOSIT RECEIVABLE (TNEB , TELEPHONE)	103,627.00	
FESTIVAL ADVANCE - 830020	101,250.00			FESTIVAL ADVANCE - 830020	94,900.00	
VEHICLE ADVANCE - 830030	103,613.00			STAFF TOUR ADVANCE	208,920.00	
FIXED DEPOSIT	79,891,396.00			VEHICLE ADVANCE - 830030	64,000.00	
STAFF OTHER ADVANCE	820,484.00			FIXED DEPOSIT	41,350,000.00	
TOUR ADVANCE	899,029.00			STAFF OTHER ADVANCE	1,428,503.00	
8th AGROVISION - NAGPUR	490,134.00			TOUR ADVANCE	1,041,000.00	
ADVANCE-OTHERS	10,000.00			8th AGROVISION - NAGPUR	490,134.00	
ANNAPOORNA FOOD FAIR -16	71,299.00			AHAR-2017	474,219.00	
HBA PRINCIPLE	27,528.00			ADVANCE-OTHERS	10,000.00	
HOSTEL FUND	766,908.00			ADVANCES SCOFTECH	150,000.00	
JAYALAKSHMI-LTC ADVANCE	384.00			ANNAPOORNA FOOD FAIR - 16	45,409.00	
KRISHI VIKAS AMARAVATHI	211,000.00			BOOKS - 660010	11,815.00	
MEDICAL ADVANCE	7,914.00			EQUIPMENT ADVANCE - 690010	729,672.00	
RECENT TREND IN PEST MANAGEMENT	140,768.00			FRANKING MACHINE ADVANCE	130,000.00	
REFUND OF VEHICLE ADVANCE	6,324.00			FUND TRANSFER TO REG.CEN.GUWAHATI	3,074,000.00	
STAFF WELFARE FUND LOAN A/C	290,563.00			SBI-31276772176		
TRANSFER OF FUND - ACADEMIC	7,058,500.00	90,975,967.00		KRISHI VIKAS AMARAVATHI	211,034.00	
				RECENT TREND IN PEST MANAGEMENT	140,768.00	
				STAFF WELFARE FUND LOAN A/C	290,563.00	
				TRANSFER OF FUND - ACADEMIC	500,000.00	
				TRANSFER TO MERIT AWARD (RECEIVABLE)	100,000.00	
				VAIBRANT GUJARAT-17	137,907.00	50,876,471.00
TOTAL C/F			421,352,547.92	TOTAL C/F		215,131,770.39



INDIAN INSTITUTE OF FOOD PROCESSING TECHNOLOGY MINISTRY OF FOOD PROCESSING INDUSTRIES, GOVERNMENT OF INDIA PUDUKOTTAI ROAD, THANJAVUR - 613 005, TAMIL NADU IIFPT CONSOLIDATED RECEIPTS AND PAYMENT ACCOUNT FOR THE YEAR ENDED 31.03.2017					
TO.,				BY.,	
TOTAL B/F		421,352,547.92	TOTAL B/F		215,131,770.39
ACADEMIC - LIABILITIES					
FUNDS FROM IICPT	500000.00		ACADEMIC - ASSETS		
TDS PAYABLE	878.00		CAUTION DEPOSIT	140515.00	
TRANSFER OF FUND FROM EXT. PROJ.	1533065.00		TDS PAYABLE	878.00	
STAFF OTHER ADVANCE	216472.00		TRANSFER OF FUND FROM EXT. PROJ.	1533065.00	
TOUR ADVANCE	14065.00		FIXED DEPOSIT	18000000.00	
TRANSFER OF FUND	13359500.00	15,623,980.00	STAFF OTHER ADVANCE	371000.00	
			TOUR ADVANCE	115000.00	
			NSS A/C	20000.00	
			TRANSFER OF FUND	13359500.00	
			TRANSFER TO IICPT A/C	2000000.00	35,539,958.00
TOTAL C/F	-	436,976,527.92	TOTAL C/F	-	250,671,728.39



INDIAN INSTITUTE OF FOOD PROCESSING TECHNOLOGY MINISTRY OF FOOD PROCESSING INDUSTRIES, GOVERNMENT OF INDIA PUDUKOTTAI ROAD, THANJAVUR - 613 005, TAMIL NADU IIFPT CONSOLIDATED RECEIPTS AND PAYMENT ACCOUNT FOR THE YEAR ENDED 31.03.2017					
Receipts		Amount (₹)	Amount (₹)	Payments	
		Amount (₹)	Amount (₹)	Amount (₹)	Amount (₹)
TO.,				BY.,	
	TOTAL B/F		436,976,527.92		250,671,728.39
	SWF - LIABILITIES				SWF - ASSETS
	LOAN RECOVERY		376,142.00		FRESH LOAN ISSUED
					342,000.00
	STUDENT MERIT AWARD - LIABILITIES				STUDENT MERIT AWARD - ASSETS
	IICPT FD-CONTRA A/C	100,000.00			TRANSFER OF FUND FROM ACADEMIC
	TDS A/C	-	100,000.00		FIXED DEPOSIT
					TDS A/C
					3,188.00
					INTEREST ACC ON EARMARKED FUNDS
					-
					3,188.00
	SCOFTECH				SCOFTECH
					TRANSFER TO IIFPT
					SBI A/C : 3113
					54,803.00
	FOODLAB				FOODLAB
					TRANSFER TO IIFPT
					BOI A/C : 9533
					10,983.00
					SBI A/C : 5078
					132,273.00
					143,256.00
	RCF - LIABILITIES				RCF - ASSETS
	IICPT OTHER CONTRA	-			TDS A/C
	FD MATURED	46535637.00			50000000.00
	TDS A/C	-	46,535,637.00		FIXED DEPOSIT RE-INVESTED
					INTEREST ACC. ON EARMARKED FUNDS
					-
					50,000,000.00
	GUWHATI - LIABILITIES				GUWHATI - ASSETS
	FUND FROM IICPT	3074000.00			TDS A/C
	TDS A/C	150150.00			155150.00
	TOUR ADVANCE RECOVERY	0.00			OUTSTANDING PAYBLE
	STAFF OTHER ADVANCE RECOVERY	27097.00			0.00
	OUTSTANDING PAYBLE	0.00	3,251,247.00		TOUR ADVANCE
					0.00
					STAFF OTHER ADVANCE
					695578.00
					650,728.00
	TOTAL C/F		487,239,553.92		302,065,703.39



INDIAN INSTITUTE OF FOOD PROCESSING TECHNOLOGY MINISTRY OF FOOD PROCESSING INDUSTRIES, GOVERNMENT OF INDIA PUDUKOTTAI ROAD, THANJAVUR - 613 005, TAMIL NADU IIFPT CONSOLIDATED RECEIPTS AND PAYMENT ACCOUNT FOR THE YEAR ENDED 31.03.2017					
Receipts		Amount (₹)	Amount (₹)	Payments	
TO.,				BY.,	
	TOTAL B/F		487,239,553.92		302,065,703.39
EXTERNAL PROJECT - LIABILITIES			EXTERNAL PROJECT - ASSETS		
	TO FD INTEREST RECEIVED	112038.00			EQUIPMENT 1931955.00
	TO SB INTEREST RECEIVED	165998.00			SOFTWARE - SPICES 436350.00
	TOUR ADVANCE RECOVERY-FCI	81196.00			TOUR ADVANCE 141050.00
	TO TOUR ADVANCE RECOVERY-FCI	2345.00			WORK ADVANCE 13500.00
	STAFF WORK ADVANCE RECOVERY-FCI	4600.00			TRANSFER OF FUNDS 5636350.00
	STAFF WORK ADVANCE RECOVERY-GAP 025	102.00			FIXED DEPOSIT 16000000.00
	FIXED DEPOSIT	13612656.00			PERFORMANCE SECURITY DEPOSIT 91600.00
	TRANSFER OF FUNDS	4436350.00	18,415,285.00		
NSS - LIABILITIES				NSS - ASSETS	
	STUDENT CORPUS FUND RECEIVED	560.00			
	ACADEMIC CONTRA	20000.00	20,560.00		
					CLOSING BANK BALANCES - (SCH-2)
					179,158,890.53
GRAND TOTAL		-	505,675,398.92	GRAND TOTAL	
				-	
				505,675,398.92	


Dr. C. Anandharamakrishnan, M.A., Ph.D., FIC
Director
Indian Institute of Food Processing Technology
(Ministry of Food Processing Industries, Govt.)
Pudukkottai Road, Thanjavur-613 005, TN.

For J. KARTHIK BHARATHI & CO.,
Chartered Accountants


S. BASKARAN
Chartered Accountant
Membership Number :211 403
Partner

INDIAN INSTITUTE OF FOOD PROCESSING TECHNOLOGY MINISTRY OF FOOD PROCESSING INDUSTRIES, GOVERNMENT OF INDIA PUDUKOTTAI ROAD, THANJAVUR - 613 005, TAMIL NADU					
CONSOLIDATED RECEIPTS AND PAYMENT ACCOUNT SCHEDULE					
SCHEDULE - 1		SCHEDULE - 2		NOTES	
OPENING BANK BALANCES: 01.04.2016	RS	CLOSING BANK BALANCES: 31.03.2017	RS	SURPLUS / DEFICIT	RS
IIFPT		IIFPT		PROJECT UNUTILIZED FUNDS :	
BOI - 789	114,907.28	BOI - 789	159,520,439.73	IIFPT	(29,017,756.46)
SBI - 6707	7,740,243.00	SBI - 6707	(2,694,490.70)	ACADEMIC	19,402,492.00
SBI - GUWHATI	16,812.35	SBI - GUWHATI	-	STAFF WELFARE FUND	25,122.50
BOI - FMKVY	5,000.00	BOI - FMKVY	4,310.00	STUDENT MERIT AWARD	(168,069.00)
SBI - ONLINE-0715	370.00	SBI - ONLINE-0715	5,324.00	RESERVE CAPITAL FUND	5,330,617.85
		FOODLAB SBI A/C 5078	139,003.00	GUWHATI	(2,875,356.00)
		SBI - Scoftechs - 3113	57,591.00	EXTRENAL PROJECT	7,557,720.96
		SBI-RECEIPTS-35697272824	10,500,199.14	NSS	(54,882.00)
		SBI-RECEIPTS-35708670687	421,526.00		
ACADEMIC		ACADEMIC			
BOI A/C : 5007	97,704.00	BOI A/C : 5007	101,683.00		
SBI A/C : 7035	1,376,868.00	SBI A/C : 7035	(119,519.00)		
SBI COLLECT A/C : 0479	81,678.00	SBI COLLECT A/C : 4988	1,175,412.00		
SBI DEPOSIT A/C - 4988	-	SBI DEPOSIT A/C - 0479	726,304.00		
STAFF WELFARE FUND		STAFF WELFARE FUND			
BOI A/C : 2682	596,432.28	BOI A/C : 2682	655,696.78		
STUDENT MERIT AWARD		STUDENT MERIT AWARD			
BOI A/C : 4098	3,200.99	BOI A/C : 4098	130.99		
SBI A/C : 2904	15,776.00	SBI A/C : 2904	(68,889.00)		
RESERVE CAPITAL FUND		RESERVE CAPITAL FUND			
BOI A/C : 2681	301,104.49	BOI A/C : 2681	94,889.34		
GUWHATI		GUWHATI			
SBI A/C : 2176	318,577.00	SBI A/C : 2176	481,126.00		
EXTRENAL PROJECT		EXTRENAL PROJECT			
SBI A/C : 1362	7,343,702.25	SBI A/C : 1362	8,153,551.25		
FOOD LAB		FOOD LAB			
BOI A/C : 9533	10,983.00	BOI A/C : 9533	-		
SBI A/C : 5078	132,273.00	SBI A/C : 5078	-		
SCOFTECH		SCOFTECH			
SBI A/C : 3113	54,803.00	SBI A/C : 3113	-		
NSS		NSS			
SBI A/C NO : 0743-(Regular)	19,695.00	SBI A/C NO : 0743-(Regular)	1,736.00		
SBI A/C NO : 2433-(Special Comp)	20,250.00	SBI A/C NO : 2433-(Special Comp)	2,524.00		
		SBI CORRUPUS A/C NO: 1632	343.00		
TOTAL	18,250,379.64	TOTAL	179,158,890.53	TOTAL	199,889.85



INDIAN INSTITUTE OF FOOD PROCESSING TECHNOLOGY MINISTRY OF FOOD PROCESSING INDUSTRIES, GOVERNMENT OF INDIA PUDUKOTTAI ROAD, THANJAVUR - 613 005, TAMIL NADU IIFPT CONSOLIDATED INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31.03.2017					
EXPENDITURE	Amount (₹)	Amount (₹)	INCOME	Amount (₹)	Amount (₹)
TO., IIFPT EXPENSES		242,969,978.91	BY., IIFPT INCOME		213,952,222.45
PROJECT EXPENSES			PROJECT INCOMES		
ACADEMIC		6,327,489.00	ACADEMIC		25,729,981.00
SWF		310.50	SWF		25,433.00
STU MERIT		568,000.00	STU MERIT		399,931.00
RCF		714.15	RCF		5,331,332.00
GUWHATI		4,789,951.00	GUWHATI		1,914,595.00
EXTERNAL PROJECT		11,445,118.00	EXTERNAL PROJECT		19,002,838.96
NSS		62,088.00	NSS		7,206.00
EXCESS OF INCOME OVER EXPENDITURE					
IICPT	(29017756.46)				
ACADEMIC	19402492.00				
STAFF WELFARE FUND	25122.50				
STUDENT MERIT AWARD	(168069.00)				
RESERVE CAPITAL FUND	5330617.85				
GUWAHATI	(2875356.00)				
EXTRENAL PROJECT	7557720.96				
NSS	(54882.00)	199,889.85			
GRAND TOTAL	-	266,363,539.41	GRAND TOTAL	-	266,363,539.41



INDIAN INSTITUTE OF FOOD PROCESSING TECHNOLOGY MINISTRY OF FOOD PROCESSING INDUSTRIES, GOVERNMENT OF INDIA PUDUKOTTAI ROAD, THANJAVUR - 613 005, TAMIL NADU IIFPT CONSOLIDATED BALANCE SHEET AS ON 31.03.2017					
LIABILITIES	Amount (₹)	Amount (₹)	A-SETS	Amount (₹)	Amount (₹)
IIFPT			IIFPT		
CAPITAL FUND	488578026.59		FIXED ASSETS-(SCH-4)		382,222,308.35
ADD: GRANT IN AID (NON-REC)	0.00		LOANS AND ADVANCE-(SCH-5)		2,532,350.00
GUWAHATI PLAN CAPITAL A/C	142100000.00		FIXED DEPOSITES-(SCH-6)		11,103,936.33
	630678026.59		CURRENT ASSETS-(SCH-7)		170,528,160.70
ADD : RESERVE AND SURPLUS			BANK BALANCE		
- ON CLOSED PROJECTS			BANK ACCOUNT-PMKVY	4,310.00	
RESERVE AND SURPLUS-SCOFTECH	(290197.00)		BOI - A/c : 789 (810011)	159,520,439.73	
RESERVE AND SURPLUS-FOODLAB	45358230.00		FOOD LAB SBI A/C : 5078	139,003.00	
	675746059.59		SBI -810010 (GUWAHATI)		
ADD : EXCESS OF INCOME			SBI A/C 35708670687	421526.00	
OVER EXPENDITURE	(29017756.46)	646,728,303.13	SBI-ONLINE A/c-35203320715	5324.00	
CURRENT LIABILITIES-(SCH-2)		71,551,150.42	SBI-PAYMENTS-33165776707	(2,694,490.70)	
PROVISION-(SCH-3)		16,061,204.00	SBI - Scoftech - 1311	57,591.00	
			SBI-RECEIPTS-35697272824	10,500,199.14	167,953,902.17
ACADEMIC			ACADEMIC		
CAPITAL ACCOUNT	34895037.00		FIXED ASSETS -(SCH.4)		176,627.00
LESS : REVERSAL	-		LOANS AND ADVANCES -(SCH.5)		-
	34895037.00		CURRENT ASSETS -(SCH.6)		41,949,945.00
ADD : EXCESS OF INCOME			BANK BALANCE		
OVER EXPENDITURE	19402492.00	54,297,529.00	BOI A/C NO: 5007	101683.00	
CURRENT LIABILITIES -(SCH.2)		2,902,559.00	SBI A/C NO: 7035	(119519.00)	
PROVISION -(SCH.3)		-	SBI COLLECT A/C NO: 4988	1175412.00	
			SBI DEPOSIT A/C - 0479	726304.00	1,883,880.00
			FIXED DEPOSITS		13,189,636.00
TOTAL C/F		791,540,745.55	TOTAL C/F		791,540,745.55



INDIAN INSTITUTE OF FOOD PROCESSING TECHNOLOGY MINISTRY OF FOOD PROCESSING INDUSTRIES, GOVERNMENT OF INDIA PUDUKOTTAI ROAD, THANJAVUR - 613 005, TAMIL NADU IIFPT CONSOLIDATED BALANCE SHEET AS ON 31.03.2017					
TOTAL B/F		791,540,745.55	TOTAL B/F		791,540,745.55
STAFF WELFARE FUND			STAFF WELFARE FUND		
CAPITAL ACCOUNT	1291875.28		CURRENT ASSETS -(SCH.2)		661,301.00
ADD : EXCESS OF INCOME			BANK BALANCE		
OVER EXPENDITURE	25122.50	1,316,997.78	BOI A/C : 2682	655696.78	655,696.78
STUDENT MERIT AWARD			STUDENT MERIT AWARD		
CAPITAL ACCOUNT	325,320.42		CURRENT ASSETS -(SCH.4)		738,067.42
RESERVE AND SURPLUS -(SCH.2)	242,396.99		BANK BALANCE		
ADD: EXCESS OF INCOME			BOI A/C:004098	130.99	
OVER EXPENDITURE	(168,069.00)	399,648.41	SBI A/C :2904	(68889.00)	(68,758.01)
CURRENT LIABILITIES -(SCH.3)		269,661.00	RESERVE CAPITAL FUND		
RESERVE CAPITAL FUND			FIXED DEPOSITS -(SCH.3)		70156880.00
CAPITAL FUND	64,776,850.05		CURRENT ASSETS -(SCH.4)		3322182.00
ADD : EXCESS OF INCOME OVER			BANK BALANCE		
EXPENDITURE	5,330,617.85	70,109,467.90	BOI A/C : 2661		94889.34
CURRENT LIABILITIES- (SCH-2)		3,464,483.44	TOTAL C/F	-	867,101,004.08
TOTAL C/F	-	867,101,004.08	TOTAL C/F	-	867,101,004.08



INDIAN INSTITUTE OF FOOD PROCESSING TECHNOLOGY MINISTRY OF FOOD PROCESSING INDUSTRIES, GOVERNMENT OF INDIA PUDUKOTTAI ROAD, THANJAVUR - 613 005, TAMIL NADU IIFPT CONSOLIDATED BALANCE SHEET AS ON 31.03.2017					
LIABILITIES	Amount (₹)	Amount (₹)	ASSETS	Amount (₹)	Amount (₹)
TOTAL B/F		867,101,004.08	TOTAL B/F		867,101,004.08
GUWAHATI-RC			GUWAHATI-RC		
CAPITAL ACCOUNT	(6393353.00)		FIXED ASSETS-(SCH.4)		497,997.00
LESS : EXCESS OF EXPENDITURE			LOANS AND DEPOSITS-(SCH.5)		72,264.00
OVER INCOME	(2875356.00)	(9,268,709.00)	BANK BALANCE		
CURRENT LIABILITIES-(SCH.2)		10,311,379.00	SBI A/C : 2176		481,126.00
PROVISION-(SCH.3)		8,717.00	EXTERNAL PROJECT		
EXTERNAL PROJECT			FIXED ASSETS-(SCH.3)		7,470,430.00
CAPITAL ACCOUNT	18456845.25		LOANS AND ADVANCES-(SCH.4)		79,636.00
ADD : EXCESS OF INCOME			CURRENT ASSETS-(SCH.5)		10,658,435.96
OVER EXPENDITURE	7557720.96	26,014,566.21	BANK BALANCE		
CURRENT LIABILITIES-(SCH.2)		347,487.00	SBI A/C : 1362		8,153,551.25
NSS			NSS		
CAPITAL ACCOUNT	20985.00		BANK BALANCE		
ADD : EXCESS OF INCOME			SBI A/C NO : 0743-(Regular)	1736.00	
OVER EXPENDITURE	(54,882.00)	(33,897.00)	SBI A/C NO : 2433-(Special Camp)	2524.00	
CURRENT LIABILITIES-(SCH.2)		38,500.00	SBI CORRPUIS A/C NO: 1632	343.00	4,603.00
GRAND TOTAL	-	894,519,047.29	GRAND TOTAL	-	894,519,047.29


 Dr. C. Anandharamakrishnan, F2010/F2012
 Director
 Indian Institute of Food Processing Technology
 (Ministry of Food Processing Industries, Govt)
 Pudukkottai Road, Thanjavur-613 005, TN.

For J. KARTHIK BHARATHI & CO.,
Chartered Accountants


 S. BASKARAN
 Chartered Accountant
 Membership Number :211 403



INDIAN INSTITUTE OF FOOD PROCESSING TECHNOLOGY

(Ministry of Food Processing Industries, Government of India)

Pudukkottai Road, Thanjavur, Tamil Nadu

e-mail: director@iifpt.edu.in ■ web: www.iifpt.edu.in

