DEPARTMENT OF FOOD ENGINEERING AND TECHNOLOGY DEPARTMENT

PREFACE

DR. U. S. ANNAPURE

Professor of Food Chemistry and Head of the Department

B. Tech., M.Sc. (Tech)., Ph.D. (Tech.)

Department of Food Engineering and Technology was established in then UDCT in 1943 offering Bachelor of Science (Tech) in chemistry of foods and drugs. Later in 1949, a full-fledged B.Sc Tech. degree course in Food Technology was started. In 1963, again for the first time in the country, masters program in fermentation Technology was initiated and the department was christened 'Food and Fermentation Technology Department'. In the 21st Century, after aligning all the graduate programs as 12+ 4 pattern, the department has focused on engineering as well. To keep up with the present times, the course in fermentation technology has been restructured as food biotechnology.

This year, with the help of our alumni the renovation of undergraduate laboratories were undertaken. Under which Food Processing Laboratory and Food Analysis Laboratary were renovated with state of the art facilities. Thanks to Dr. Anil Srikhande from USA and Mr. Lalit Chadha from Valorganics Ltd., Mumbai for their generous donations for the cause. There are plans to renovate some more laboratories for next year too. Department have continued its excellence in achievements this year also in academics as well as research. Currently there are 46 PhD fellows and 56 M.Tech students working in the Department. From this year, ICT has started two new campuses at Jalna, Maharashtra and Bhubaneswar, Odisha. Our department takes a pride to note that, Prof. S.S. Lele, Professor in Biochemical Engineering has been appointed as Director for ICT Marathwada Campus, Jalana.

Overall, this year was an excellent for the academics, research and campus placement.

VISION

"Establishing a center of excellence to provide demand driven, value-based and quality technical education to make India a developed country through socio-economic transformation"

MISSION

- To improve food, especially Indian traditional foods, in terms of nutrition, safety and functionality employing fundamental and applied sciences.
- To produce trained personnel of highest standards for the benefit of the industry and society, in the field of food engineering & technology and food biotechnology.
- To provide leadership in areas of education, research, innovations and solutions in food and biotech sciences, technology and engineering to direct overall activity towards economic growth of India.

RESEARCH ACTIVITIES AND INSTRUMENTAL / LAB FACILITIES AVAILABLE :

Major Research Interests

Thrust areas under CAS include –

Carbohydrate Chemistry & Technology

- Cereal science & technology
- Chemistry & technology of traditional foods
- Enzymology, enzyme applications, modification of enzymes
- Food product / process development; instant food premixes
- Food quality analysis
- Fruits and vegetable processing
- Fermentation Technology & Food Biotechnology
- Fermented foods
- Fermentative production and downstream processing of enzymes / metabolites
- Nutraceuticals & natural pigments
- Nutrigenomics
- Plant tissue culture

MAJOR INSTRUMENTAL / PROCESSING FACILITIES

Infrastructure

The FETD is well structured with equipments required for food processing that include extruders, retort processing unit, blast and fluidized freezer, pasta making machine, modified atmosphere packaging, dough sheeter, tray and IR dryer, fluidized bed dryer, fermentor, high pressure homogenizer, ultrasonic processor, RO and ultrafiltration unit, spray dryer, supercritical extraction unit, and twin screw extruder.

The FETD also houses many analytical instruments such as Rheometer, HPLC, HPTLC, GC, GCMS, spectrophotometers, Hunter lab colorimeter, supercritical carbon dioxide extraction unit, image analyzer, Brookfield rheometer, texturimeter, Haake viscometer, electrophoresis unit, protein purification system, PCR thermal cyclers, RT-PCR, and differential scanning calorimeter (DSC).

PROGRAMS OFFERED

Sr. No.	Degree	Comments	No. of seats
1	B.Tech. (Food Engineering & Technology)	AICTE Approval in 2002 and later in 2008 (12 + 4) Pattern.	16
2	M.Tech. (Food Engineering & Technology)	AICTE Approval in 2008 and NBA accreditation in 2013	10
3	M.Tech. (Food Biotechnology) (Restructured Fermentation Technology course)	AICTE Approval in 2008.	10
4	Ph.D. (Tech.) (Food Engineering and Technology	As per the availability of seats	
	Ph.D. (Tech) (Food Biotechnology)		
	Ph.D. (Tech) (Bioprocess Technology)		
	Ph.D. (Biotechnology)		
	Ph.D. (Biochemistry)		
	Ph.D. (Food Science)		

* At Institute level

CURRENT STUDENTS:

Course	No. of Students	
	2017-18	2018-19
Masters (both years)	50 [including 8 M.Tech (BPT) &1 M.Tech.(GT)]	56 [including 8 M.Tech (BPT) &1 M.Tech.(PF)]
Ph.D. (Tech) (all)	30	26
Ph.D. (Sci) (all)	25	20

DEGREES AWARDED

Name of Degree	No. of Students	
	2017-18	2018-19
B.Tech	14	16
M.Tech.	22 [including 4 M.Tech (BPT)]	24 [including 4 M.Tech (BPT) & 1 Green Technology]
Ph.D. (Tech)	6	8
Ph.D. (Sci)	3	6

RESEARCH OUTPUT

		2017-18	2018-19
No. of Research Project	Govt.	6	9
	Private	6	7
No. of consultation Assignments		3	1
No. of Patents	Applied	-	2
	Obtained	-	1
No of Paper Published	National	-	-
	International	34	44
Book Chapters		3	7
No. of Conference Presentations	National	6	2
	International	1	
Citations*		>2628	

*from the google scholar for the calendar year 2019

DR. U. S. ANNAPURE

B. Tech., M.Sc. (Tech)., Ph.D. (Tech).

Professor of Food Chemistry and Head of the Department

SUBJECTS TAUGHT

Food Chemistry, Principles of food Preservation,Technology of Fruits, Vegetables and Tubers, Current topics in Food Science and Technology, Microbiology Lab, Carbohydrate Chemistry and Technology

RESEARCH INTERESTS

Cold Plasma Technology for Food Procesing, Extrusion processing – process and product Development, Frying - Chemistry and Technology, Nutraceuticals – Chemistry, Technology and Product Development, Carbohydrates – Chemistry and technology of minor grains, tubers and plant gums, Traditional foods - Product and technology development, Enzyme applications in food processing, Downstream processing- enzymes, antioxidants, and biomolecules

RESEARCH STUDENTS

Ph.D. (completed). – 12
Masters (completed) – 63
Ph.D. (ongoing) – 15
Masters (ongoing) – 10

RESEARCH PUBLICATIONS

International- 77
International (this year)-4
National- 9
Conference Proceedings – 72
Patents- 3
Book Chapter – 3

SPONSORED PROJECTS

Government – 2 (completed)
Government – 1 (ongoing)
Private – 2 (completed)
Private – 3(ongoing)

AWARDS/HONOURS

National - 01
H-INDEX: 20
Citations: 1200
*As per google scholar on June, 2018

PROFESSIONAL ACTIVITIES

- Vice President of AFST (I), Mumbai Chapter 2016-17.
- Member, Board of Studies (BoS) for M.Sc. Food Technology at Defence Institute of Advanced Technology (Deemed University), Pune.
- Member, Research and Recognition Committee in subject of food science and technology at Shivaji university Kolhapur, 2017-18
- Member, selection committee for promotion under CAS, Dr. Babasaheb Ambedkar marathwada university.
- Member, selection committee for promotion under CAS at North Maharashtra university, jalgaon.
- Member, RRC in subject of chemical technology (food) at Dr. Babasaheb Ambedkar marathwada university.
- Member, Research advisory committee, Indian Institute of food processing Technology (IIFPT,Tanjavur).
- Referee, for various national and international journal in the area of food science and technology.
- Examiner for Ph.D thesis of various universities in India.
- Member, food additives sectional committee (FAD 8) at BUREAU of Indian standard New Delhi.
- Member, National Core group for broad subject matter area(BSMA), Indian counsil for education research(ICAR), New Delhi.
- Member, committee for scrutinizing minor research proposal at Mumbai university
- Member, Selection committee for appointments of Assistant Professor at Shivaji University Kolhapur.
- Life Member, Association of Food Scientists and Technologists, India [(AFST (I)].
- Life Member, Association of Carbohydrate Chemists and Technologists of India (ACCTI).
- Life Member, Biotech Research Society of India (BRSI).
- Member, International Society of Food Engineering (ISFE), USA.
- Life Member, UDCT Alumni Association.

HIGHLIGHTS OF RESEARCH WORK DONE AND ITS IMPACT

Cold plasma can be used as a non-thermal process which is capable of surface modification and surface sterilization. The plasma processing of food grains may lead to changes in surface morphology. The objectives of these studies may include but not limited to study the physico-chemical changes occur during plasma treatment and their impact on overall quality of the grains.

Extrusion is being commonly used for manufacture of sncak foods. The process is well studied with the common cereals and few legumes as a raw material. In our laboratory the focus is on the possible utilization of indigenous grains and legumes so that the locally available raw material can be utilized for extrusion as well as there will be value addition to these indigenous grains.

Gums are being commonly used in food systems as stabilizers, viscosity and texture modifying agents. Few plant gums are well established for their food applications but our focus is to identify and explore the edible gums from lesser known indigenous plants. The isolated gums will be studied for their characteristics includes but not limited to viscosity, rhelological properties and food applications.

TEN BEST REPRESENTATIVE PUBLICATIONS/PATENTS

Sr. No.	Title	Journal	Year, Vol.: Page no.	Journal impact factor (5 year)
1	Plasma activated water (PAW): Chemistry, physico-chemical properties, applications in food and agriculture	Trends in Food Science & Technology	2018, 77, 21-31	6.6
2	Physicochemical, functional and rheological investigation of Soymidafebrifuga exudate gum	International Journal of Biological Macromolecules	2018, 111, 1116-1123	3.92
3	Influence of cold plasma on fungal growth and aflatoxins production on groundnuts	Food Control	2017, 77, 187-191	3.67
4	Comparative study of Acacia nilotica exudate gum and acacia gum	International Journal of Biological Macromolecules	2017, 102, 266-271	3.92
5	Functional and rheological properties of cold plasma treated rice starch	Carbohydrate Polymers	2017, 157, 1723-1731	5.11
6	Cyclosporin A — A review on fermentative production, downstream processing and pharmacological applications	Biotechnology Advances	2011, 29 418–435	11.85
7	Acrylamide content in fried chips prepared from irradiated and non-irradiated stored potatoes	Food Chemistry	2011, 127 (4), 1668-1672	4.9
8	Effect of damaged starch on acrylamide formation in whole wheat flour based Indian traditional staples, chapattis and pooris	Food Chemistry	2010, 120(3), 805-809	4.9
9	Effect of an alkaline salt (papadkhar) and its substitute (2:1 sodium carbonate:sodiumbicarbonate) on acrylamide formation in papads	Food Chemistry	2009, 113(4), 1165–1168	4.9
10	Response surface methodology in media optimization for production of carotene fromDaucuscarota.	Plant Cell, Tissue and Organ Culture	2008, 93:123-132	3.663

PROFESSOR R. S. SINGHAL

B.Sc.(Hons.), M.Sc.(Tech.), Ph.D.(Tech.)
Fellow, Maharashtra Academy of Sciences
Fellow, Association of Food Scientists and Technologists (India)
Fellow of the Biotech Research Society of India (BRSI)
Fellow (FIBA) of the International Bioprocessing Association- An International Forum
Dean, RCM, ICT
Professor of Food Technology

SUBJECTS TAUGHT

Food additives and ingredients, Principles of food analysis, Comprehensive Techniques in Food Analysis, Technology of Dairy, Animal and Plantation Products, Food safety and toxicology

RESEARCH INTERESTS

Food quality, Food chemistry, Biopolymers, Lipid chemistry and technology, Food product development, Food processing, Fermentative production and downstream processing of biomolecules, Traditional foods.

Ph.D. (completed) –34
Ph.D. (ongoing) – 14

Masters (completed) – 101
Masters (ongoing) – 08

Post-docs (completed) – 4
Post-docs (ongoing) – 1

PUBLICATIONS

Internationa l- 311, National- 9
Conference Proceedings – 140

Book chapters- 36

Patents: 1 granted, 2 applied

SPONSORED PROJECTS

Private – 5 (completed)

Government – 4 (completed)

AWARDS/HONOURS:

National - 5

International - 1

H-INDEX: 63*/48**

citations: 16191/10201

As per Google scholar*/Scopus** on December 20, 2019

PROFESSIONAL ACTIVITIES

- Member, Editorial Board, Carbohydrate Polymers, Elseviers, UK
- Member, Selection committee for promotions, BARC, Mumbai.
- Member, Expert group in the area of secondary agriculture, Department of Biotechnology, Government of India.
- Member, Subject Expert Committee (SEC) on Engineering & Technology (ET), WOS-A scheme Department of Science and Technology, New Delhi.
- Member, Subject Expert Committee (SEC) on Health, Food and Nutrition (HFN), WOS-B scheme Department of Science and Technology, New Delhi.
- Member, Scientific panel of FSSAI, New Delhi, on i) Food Additives, Flavouring, processing Aids and Materials in Contact with Food, and ii) Water (including flavoured water) and beverages (alcoholic and non-alcoholic)
- Life Member, Association of Food Scientists and Technologists (India).
- Life Member, Association of Carbohydrate Chemists and Technologists, India.
- Member, Advisory Board, Trends in Carbohydrate Research, published by ACCT (I).
- Member, BIPP, BIG, SBIRI, SPARSH, BIRAP, and Secondary Agriculture/ Food Processing Entrepreneurial Network (SAEN) in Punjab, Department of Biotechnology, Government of India
- Member, Monitoring Committee on CSIR Mission on Nutritionals and Nutraceuticals
- Member, Technical Expert Committee (TEC) on Medicinal Aromatic Plants, Bioresource and Secondary Agriculture and Silk Biotechnology for NER, DBT, Government of India.
- Special invitee, Expert Committee meeting of Engineering Sciences – NPDF, DST, Government of India
- Member, working group, Preparation of Teachers' Manual for Jeevan Kaushal (Life Skills) Curriculum, UGC, New Delhi
- Referee, Several journals in food science and technology, and bioprocess technology
- Examiner, Ph.D thesis at some universities in India and one in Malaysia

Highlights of research work done and its impact

Professor Rekha Singhal has made outstanding contributions in the area of biopolymers in foods, in particular to polysaccharides and their modifications and their applications in the area of microencapsulation of numerous sensitive food constituents such as spice oleoresins, neutraceuticals and flavours. She successfully explored the use of indigenous raw materials for microencapsulation as an alternative to import substitutes; to fermentative production and downstream processing of industrial biomolecules such as therapeutics (clavulanic acid, cyclosporin), neutraceuticals (lycopene, ubiquinone, zeaxanthin, gamma-linolenic acid), enzymes (glutaminase), polymers of varied industrial interest (polyglutamic acid, polylysine), and microbial polysaccharides (schizophyllan, curdlan, scleroglucan) among many others. Her work on supercritical carbon dioxide extraction of food/ pharmaceutical constituents and microbial metabolites is noteworthy. Besides, she has worked in frontier areas in food science and technology including traditional Indian foods with an aim to improving their quality and establishing the authenticity. In particular, her work on investigating acrylamide in traditional Indian foods was the first of its kind in the country and has received laurels. Her work on hydrocolloids for reducing oil content of deep-fat fried foods attracted the food industry and catalyzed their acceptance as permitted additives by the legal authority in India (PFA). She has collaborated with scientists both in India (BARC, NIIST) and abroad (Aalto University, Finland; IIT Chicago) on topics of mutual interest such as food toxicology and biofuels, and has publications in standard journals based on the work undertaken.

TEN BEST REPRESENTATIVE PUBLICATIONS/PATENTS

Sr. No.	Title	Journal	Year, Vol.: Page No.	Journal impact factor (5 year)
01	Resistant starch-a review	Comprehensive Reviews in Food Science and Food Safety	2006, 5(1): 1-17	8.738
02	Glucose oxidase—An overview	Biotechnology Advances	2009, 27(4): 489-501	13.769
03	Microbial cellulose: fermentative production and applications.			
	Food Technology & Biotechnology	2009, 47 (2): 107 – 124	1.517	
04	Comparison of artificial neural network (ANN) and response surface methodology (RSM) in fermentation media optimization: Case study of fermentative production of scleroglucan	Biochemical Engineering Journal	2008, 41(3): 266-273	3.327
05	Biosynthesis of silver nanoparticles using aqueous extract from the compactin producing fungal strain	Process Biochemistry	2009, 44(8): 939-943	3.089
06	Microencapsulation of cardamom oleoresin: Evaluation of blends of gum Arabic, maltodextrin and a modified starch as wall material	Carbohydrate Polymers	2005, 61(1): 95-102	5.975
07	Poly (glutamic acid)–an emerging biopolymer of commercial interest	Bioresource Technology	2011, 102 (10), 5551-5561	6.589
08	The use of gum arabic and modified starch in the microencapsulation of a food flavoring agent	Carbohydrate polymers	2005, 62 (4), 309-315	5.975
09	Microencapsulation of black pepper oleoresin	Food Chemistry	2006, 94 (1), 105-110	5.488
10	Stability of cumin oleoresin microencapsulated in different combination of gum arabic, maltodextrin and modified starch	Carbohydrate Polymers	2007, 67 (4), 536-541	5.975

PROFESSOR S. S. LELE

B.Chem.Engg., M.Chem.Engg., Ph.D. (Tech.)

Fellow, Maharshtra Academy of Sciences
Fellow, Biotech Research Society of India (BRSI)
Director& Professor of Biochemical Engineering

SUBJECTS TAUGHT

Introduction to Chemical Engineering, Advances in Food Engineering

RESEARCH INTERESTS

Food product/process development, fruit and vegetable based dehydrated / wet nutritious product development, fruit wines, and biological effluent treatments.

RESEARCH STUDENTS

Ph.D. (completed) –30
Masters (completed) – 71
Ph.D (Tech)- 04
Ph. D (Science)- 04
Ph.D. (ongoing) – 02
Masters (ongoing) – 02M.Tech- 04

RESEARCH PUBLICATIONS

International- 120
National- 9
Proceedings – 27
PAPER REVIEWED- 5
Book / chapters – 5 chapters

PATENTS

02 (granted), 01 (applied)

SPONSORED PROJECTS

Government – 11 (completed)
Ongoing- 1

AWARDS/HONOURS:

National – 12
International – 1
H-INDEX - 28 (Google), 23 (Scopus)
Citations: 3265(Google)

PROFESSIONAL ACTIVITIES

- Member CSIR- Food and Safety Solution (Focus)- 2018-2020
- Member, FIST program for science colleges, DST, 2017-2020
- ICT Coordinator, Unnat Bharat and Maharashtra Abhiyaanprogramme.
- Member, Examination Board, K J Somaiya College of Engineering, SomaiyaVidyavihar, Mumbai. (Since 2014 – till date)
- Life member of a number of national and international professional bodies engaged in activities related to Science & Technology and Women Scientists, AFST, AMI, BRSI, IIChE, UAA.

Highlights of research work done and its impact

Prof. S.S. Lele is a dynamic personality with an exceptional career in research as well as academic administration. She is well known for her outstanding contribution to the field of food technology-engineering for the last four decades. She is actively involved in research and translation and is responsible for the conception and successful operation of several food processing start-ups. She has published over 150 international papers in refereed journals and has 2 patents granted to her credit.

In last two decades, Prof. Lele has been working in the field of developing fruit and vegetable “processes and products” as her research theme. While working on fundamental science to train the students, the focus was also on solving grass root problems which resulted into commercially successful endeavors. During this, over 150 research students were trained as problem solvers and some also developed entrepreneurship spirit and have started their own processing units. In addition, in last 10 years Prof. Lele has singlehanded conducted about 10 hands on trainings on the various food processing technologies (dehydration, retorting, non-grape wine making etc.) where approximate 1000 persons are trained on food processing (dehydration, retort processing, fruit wine making etc.)

Prof. Lele’s goal is to uplift farmers with a 4-Win approach for all stake holders – farmer, processor, consumer, society. She has initiated a positive agreement with farmers allowing them to sell in open market if price rises. For example, backward integration of nearly 200 farmers in vicinity of Satara area has increased the farmers’ income to Rs 2 lakh per year per acre from a meagre figure of only Rs. 30,000 PA. The agreement is signed with the farmers in a positive manner where assured price for fresh produce is committed but in case the market rate rises, the farmers are free to go to the market and sell their crop at higher rate. Yet the processing Unit sustains

due to multipurpose multi product processes developed. A few start up units have been set up in remote areas of Maharashtra (Western Ghats and Konkan Region) where livelihood is generated for the rural population. The retort product plant is capable of making 6 tons wet product (RTE) and drying unit makes 4 tons dry flex and the plant has reached break even in 4 years. Unique products (local traditional leafy vegetables like arvi leaves) and healthy and home style products like moon dal khichadi are very popular. Some of the retort products have been approved by the Indian Army due to the high quality, home-like taste and absence of preservatives.

After successful mentorship of the Startup at Satara (Trilok Food) for wet and dry vegetable products, Dr. Smita received State Govt. Grant to help small farmers from Konkan area to make value added products from local fruits. She has developed non grape fruit wine technology and again mentor a startup "Sawarde Valley Food Foundation", SVFF a Section 8 nonprofit company, located in Chiplun, Ratnagiri. The frutine brand is established and especially Jamun wine is appreciated due to its health benefits for diabetics. Other fruits like mango, kokum, and jackfruit are also used. It is the first commercial attempt of its kind in the nation. The project is economically sustainable with 20,000 liters of fruit wine is made in a year. The demo plant has 500 lit fermenters where as the pilot is hyaving 5000 lit fermenters with total capacity of 12000 lit. Demo plnat is use to teach hyands on non grape wines and so far 5 workshops are conducted and more than 100 youngsters have taken benefit and sonme are strating small units.

What sets Prof. Lele apart is her constant endeavor to serve society through science and technology. She has been an active life member of AFST (I) and was elected as President of AFST (I), Mumbai Chapter (2011-13). Mentoring students for personality development, career planning and developing interest in science is her favorite activity. She has been taking sessions on these topics across the country. In addition, she single handed organized National Science Day on 28th Feb every year in UDCT (ICT) since 1993 to 2008 for high school and college students. She must have influenced thousands of students and guided them for appropriate selection of career at crucial time in their life. Yet another sector of the society for which Dr. SmitaLele has devoted significant time in last 40 years is helping house wives to save energy and retain nutrition in the kitchen, developing scientific temper in life, awareness on right food, nutrition and positive attitude. Periodical writing, talks, interviews, counselling and many more tools were used for this. Her books and videos, radio talks and TV interviews on these topics must have touched millions of souls and improved their day to day life, health and profession as well.

TEN BEST REPRESENTATIVE PUBLICATIONS/PATENTS

Sr. No.	Title	Name of the Journal	Year, Vol.: page no.	Journal impact factor (5 year)
1	Kinetic modeling and implementation of superior process strategies for beta-galactosidase production during submerged fermentation in a stirred tank bioreactor.	Biochemical Engineering Journal	(2013). 77 49–57	2.984
2	Use of a batch-stirred reactor to rationally tailor biocatalyticpolytransesterification.	Biotechnology and Bioengineering	(2000) 67 (4): 424-434.	3.648
3	Modelling of air-lift fluidized bed: Optimization of mass transfer with respect to design and operational parameters	Chemical Engineering Journal	(1992) 49 (2): 89-105	3.691
4	Three Phase Partitioning of galactosidase produced by an indigenousLactobacillus acidophilus isolate	Separation and Purification Technology	(2013). 110 (2013). 44–50	3.525
5	Synthetic dye decolorization by white rot fungus, Ganoderma sp.	Bioresource Technology	(2007) 98 (4): 775-780.	5.172
6	Kinetic and equilibrium modeling of chromium (VI) biosorption on fresh and spent Spirulina platensis/Chlorellavulgaris biomass.	Bioresource Technology	(2008) 99 (9): 3600-3608.	5.172
7	Simultaneous removal of carbon and nitrate in an airlift bioreactor	Bioresource Technology	(2009). 100 (3): 1082-1086.	5.172
8	Value addition of oilseed meal: a focus on bioactive peptides D Kadam, SS Lele 12 (1), , 2018	Journal of Food Measurement and Characterization	449-458	
9	Extraction and characterization of natural enzymes from bottle gourd (Lagenariasiceraria) and effect of enzyme inhibitors in extending the shelf life of bottle gourd … S Palamthodi, D Kadam, S Lele	Journal of Food Measurement and Characterization	12 (3), 2103-2109, 2018	
10	Dough browning inhibition of multigrain Indian flatbread (chapatti) using a combination of chemical and microwave treatment A Banerji, L Ananthanarayan, SS Lele Journal of Food Measurement and Characterization 13 (1),		807-820 , (2019)	

DR. LAXMI ANANTHANARAYAN

B.Sc. (Hons.),B.Sc. (Tech), M.Sc. (Tech.), Ph.D.(Tech.)

Professor, Coordinator, M. Tech.in Food Biotechnology

SUBJECTS TAUGHT

Chemistry of food constituents, Nutrition,Nutraceuticals and Functional Foods, Food Packaging Science and Technology, Introduction to Food Science and Technology, Current topics in Food Science and Technology, Food Biotechnology, Food Packaging, Basics of Human Nutrition, Advances in nutrition

RESEARCH INTERESTS

Traditional Foods, Fermented foods, Low GI foods, Fruit and vegetable processing, Protein purification, Enzymology, Nutraceuticals/ health beneficial phytoconstituents, Natural pigments, Microbial metabolites, Bioactive peptides,protein hydrolysates, Novel methods of food processing and preservation such as ultrasonication and edible coating, plant based enzymes,development of novel nutritional products, Food adulteration/ contamination/ authentication/ allergenicity testing by proteomics/ genomics, problems of small scale food industries, food safety and quality.

RESEARCH STUDENTS

Ph.D. (ongoing) – 09
(+02 Co-guide)
Masters (completed) – 80
Ph.D. (Completed) – 08
Masters (ongoing) – 08

RESEARCH PUBLICATIONS

International - 53
National- 06
Book / chapters- 01
H-INDEX: 15
citations: 1820 (Scopus)

PROFESSIONAL ACTIVITIES

- Life Member, Association of Food Scientists and Technologists (India).
- Life Member, UDCT Alumni Association.
- Member of Board of studies of Biotechnology Department of SIES College, Mumbai.
- University Nominee on The Board of studies at Modern College, Vashi.
- Member of Board of studies of Biochemistry Department of Sophia College for Women, Mumbai.

HIGHLIGHTS OF RESEARCH WORK DONE AND ITS IMPACT

Prof. Laxmi Ananthanarayan has carried out extensive research on varied topics of Food science and technology, Bioprocess technology, Food biotechnology and Biochemistry. She has worked in the area of traditional foods, fermented foods, foods with improved nutritional properties, functional foods, healthy snacks, extruded foods, etc. Her work on prevention of staling in chapatti has been widely recognized and referred to by small scale manufacturers while her work onidli batter stabilization and preservation has also attracted the attention of producers in this sector. She has also explored various nutritional aspects of foods such as bioactive peptides, legume based allergens, isoflavones from legume sources and nutraceutical rich ingredients. She has investigated the exploitation of novel methods of food processing for food preservation such as edible coatings, ultrasonication, MAP to name some. She has shown interest in developing methods for detection of food adulteration based on proteomics and has undertaken research in the area of food safety. She has also undertaken research in the area of characterization and deactivation of fruit based enzymes and enzyme inhibitors. Natural plant based sources of pigments and plant based enzyme activities are also topics of research interest for her. Prof. Ananthanarayan has undertaken extensive research in exploring the production, purification and characterization of various microbial metabolites such as enzymes, pigments and antimicrobials.

TEN BEST REPRESENTATIVE PUBLICATIONS/PATENTS

Sr. No.	Title	Name of the Journal	Year, Vol.: Page no.	Journal impact factor (5 year)
1.	Glucose oxidase—an overview	Biotechnology advances	27 (4), 489-501	12.831
2.	Purification of a bifunctional amylase/protease inhibitor from ragi (Eleusinecoracana) by chromatography and its use as an affinity ligand	Journal of Chromatography B	2010, 878 (19), 1549-1554	2.729
3.	Effect of stabilizers on stabilization of idli (traditional south Indian food) batter during storage	Food hydrocolloids	2005, 19 (2), 179-186	
	5.089			
4.	Enzyme stability and stabilization—aqueous and non-aqueous environment			
	Process biochemistry	2008, 43 (10), 1019-1032	2.616	
5.	Enzyme aided extraction of lycopene from tomato tissues	Food chemistry	2007, 102 (1), 77-81	5.399
6.	Use of response surface methodology to investigate the effects of milling conditions on damaged starch, dough stickiness and chapatti quality	Food chemistry	2009, 112 (4), 1010-1015	5.399
7.	Optimization of Aspergillusniger fermentation for the production of glucose oxidase	Food and Bioprocess Technology	2009, 2 (4), 344	3.032
8.	Three phase partitioning as a novel method for purification of ragi (Eleusinecoracana) bifunctional amylase/protease inhibitor	Process biochemistry	2007, 42 (3), 491-495	2.883
9.	Effect of stabilizers on stabilization of idli (traditional south Indian food) batter during storage	Food hydrocolloids	2005, 19 (2), 179-186	5.089
10.	Effect of alpha-amylase addition on fermentation of idli-A popular south Indian cereal-Legume-based snack food	LWT - Food Science and Technology	2008, 41(6):1053-1059	3.107

DR. S. S. ARYA

B.Tech., M. Tech, Ph. D (Tech.)

Assistant Professor of Food Technology

SUBJECTS TAUGHT

Technology of cereals, legumes and oilseeds, Food microbiology, Technology of plantation crop, Current topics in food science and technology, Basics of food science and technology, Advances in food biotechnology and genetics, Food processing (I), Food analysis (Chemical), Technical analysis-I,II, Food technology laboratory

RESEARCH INTERESTS

Non thermal processing, cavitation, sonication, green extractions of food bioactives, Cereal chemistry and processing – process and product development, Indian Traditional foods, Nutraceutical and functional foods, Cereal legume health products - low glycemic index foods, gluten free formulations, food for heart, utilization of food waste, Fermented indigenous foods, Downstream processing of biomolecules.

RESEARCH STUDENTS

Ph.D. (ongoing) – 04
Ph.D. (Completed) – 04
Masters (completed) – 33
Masters (ongoing) –09

RESEARCH PUBLICATIONS

International –55;
International (this year)-14
National- 05
Conference Proceedings – 32
Book / Monograph- 2
Book Chapters: 03

SPONSORED PROJECTS

Government -3 (Completed)
Government -3 (Ongoing)
H-INDEX: 16
citations: 865

*As per google scholar on December 2019

PROFESSIONAL ACTIVITIES

- Member, Global Young Academy, Halle, Germany, 2018
- Member, Indian National Young Academy, INSA, Government of India New Delhi
- Member, National Science and Technology Innovation Policy, PSA, Government of India
- Local Executive Committee Member, Association of Food Scientists and Technologists (I), Mumbai Chapter
- Life Member, Biotechnology Research Society of India (BRSI), India.
- Life Member, Association of Carbohydrate Chemists and Technologists of India.
- Member, Society of Chemical Industry (SCI), London.
- Member, International Society of Food Engineering (ISFE), Pullman, USA.
- Member, OWSD, TWAS, Italy
- Member, CFT-PBN Alumni Association (CPAA), Mumbai

HIGHLIGHTS OF RESEARCH WORK DONE AND ITS IMPACT

Dr Shalini Arya works in the area of Indian traditional foods, in particular cereal based staple foods such as chapatti, phulka, thepla, khakhara, thalipeeth, naan and kulcha. Her work is focused on various aspects such as product development and standardisation, nutritional improvement and characterisation, chemistry and technology, staling, extension of shelf life using various technologies (MAP, oxygen scavenger, chemical, freezing etc) for these products, all of which would have far reaching significance in improving public health in India and that too based on the resources that are locally available and food staples that are regularly consumed by the locals.

Her work on chapatti was recognised during international and national conferences and was awarded with first prize under cereal category. She also works on utilisation of food industry waste into value added products, bioactive peptides from underutilised plant seeds, development of low glycemic index foods, functional food products from peanuts and quality improvement of gluten free flat bread.

India unfortunately becoming capital country for diabetes and cardiovascular affected population and thus developing cost effective product technologies is very necessary. Dr Shalini and her research group have developed Indian traditional food products having low glycaemic index using low cost and locally available ingredients. In addition to this Dr. Shalini has been helping multinational food industries for developing traditional food product technologies for e.g. chapatti, paratha, bhaji, instant food mixes. She has helped industries for developing low glycaemic index formulation, high soluble fiber paratha premixses, high protein atta premix and other healthy low cost nutritious premixes.

TEN BEST REPRESENTATIVE PUBLICATIONS/PATENTS

Sr. No.	Title	Name of the Journal	Year, Vol.: page no.	Journal impact factor (5 year)
1	Comparative assessment of high-intensity ultrasound and hydrodynamic cavitation processing on physico-chemical properties and microbial inactivation of peanut milk	Ultrasonics Sonochemistry	2019, 58, 104728	7.28
2	A Fuzzy Mathematical Approach for Selection of Surface Coating and Its Effect on Staling Kinetics in a Formulated Gluten-Free Flatbread	Food and Bioprocess Technology	2019, 12(11), 1955-1965	3.032
3	Hydrodynamic cavitation for energy efficient and scalable process of microalgae cell disruption	Algal Research	2019, 40,101496	3.723
4	Novel, Nonthermal, Energy Efficient, Industrially Scalable Hydrodynamic Cavitation–Applications in Food Processing	Food Reviews International	2019	3.933
5	A novel, green cloud point extraction and separation of phenols and flavonoids from pomegranate peel: An optimization study using RCCD	Journal of Environmental Chemical Engineering	2019	4.09
6	Effect of flaxseed flour addition on physicochemical and sensory properties of functional bread	LWT- Food Science and Technology	2014, 5 (2): 614–619	3.107
7	Use of response surface methodology to investigate the effects of milling conditions on damaged starch, dough stickiness and chapatti quality	Food Chemistry	2009, 112 (4): 1010-1015	3.334
8	Staling of chapatti (Indian unleavened flat bread)	Food Chemistry	2007,101: 113-119	3.334

DR. JYOTI S. GOKHALE

B.Pharm., M. Tech, Ph. D (Tech.)

UGC Assistant Professor

SUBJECTS TAUGHT

Biotechnology of Fermented Foods, WasteManagement in Food Processing, Nutraceuticals and Functional Foods, Biochemistry Lab, Technical Analysis Lab, Biochemical Engineering and Technology, Food Biotechnology Lab

RESEARCH INTERESTS

Food Biotechnology, Bioprocess Technology, Waste Management, Fermentation Technology,

RESEARCH STUDENTS

Masters (completed) – 07
Masters (ongoing) – 05

Publications

International- 6
Book Chapter - 02
H-INDEX: 4
Citations: 70

*As per Scopus on June30, 2019

HIGHLIGHTS OF RESEARCH WORK DONE AND ITS IMPACT

Chirality is a ubiquitous concept in nature. It is of utmost importance in drug synthesis and is a key factor in the safety and efficacy of many drug products and thus the production of single enantiomers of drug intermediates has become increasingly important in the pharmaceutical industry. Chiral drugs continue to be a significant force in the global pharmaceutical market. About one third of all medicinal drugs are chiral. The Ph.D. work was centered on the use of enzymes in non-aqueous media to synthesize enantiomerically pure products of commercial value in pharmaceutical and fine chemical industry. The kinetic modeling was also considered in each case. Reaction schemes are as follows:

Kinetic resolution of (±)-1-phenylethanol using vinyl acetate as an acyl donor over immobilized Candida antarticalipase

- Microwave irradiated enantioselective acylation of (±)-1-phenylethylamine using ethyl acetate as an acyl donor
- Kinetic resolution of 2-pentanol, an antialzhiemer's drug, using vinyl acetate as an acyl donor
- Enantioselective acylation of 2-octanol with vinyl acetate as an acyl donor using Novozyme 435
- Research at University of Saskatchewan, Canada
- Characterization of waste pinewood and its conversion into bio-oil under supercritical water

Mountain pine bettle infested pine wood has been used as a feedstock for biofuel production under supercritical water. Biomass has been characterized with different techniques such as FTIR, Ash content, volatile matter content, XRD and determination of extractives. Bio-oil thus produced under hydrothermal treatment has been characterized using different analytical techniques such as FTIR, NMR and GCMS. HMF was found to be the major component of bio-oil, which can be converted to 2,5-dimethyl furan, which is a liquid fuel, in certain ways superior to ethanol.

- Optimization of lipase catalyzed biodiesel production from canola oil using response surface methodology

Research work done during M. Tech. Bioprocess Technology

Nowadays, lipases are used as a routine tool for the preparation of pharmaceutical drugs and drug intermediates. Esterification of p-amino phenyl acetic acid was carried out using different lipases, amongst which Novozyme 435 was found to be the most active catalyst to produce ethyl p- amino phenyl acetate, which is a drug intermediate of an antiarthritic drug, Actarit. The effects of various parameters on the conversion and the rates of the reaction were studied in the presence of Novozyme 435 with toluene as a solvent under microwave irradiation. Both the initial rate data and the progress curve analysis were used to arrive at the ping pong bi bi mechanism with inhibition by p-amino phenyl acetic acid. The model fits the initial rate data very well. This work has shown that ethyl p- amino phenyl acetate, a drug intermediate of actarit, can be synthesized by lipase catalyzed esterification reaction in toluene as a solvent.

TEN BEST REPRESENTATIVE PUBLICATIONS/PATENTS

Sr. No.	Title	Name of the Journal	Year, Vol.: page no.	Journal impact factor (5 year)
1	Optimization and kinetic modeling of lipase catalyzedenantioselectiveN-acetylation of (±) - 1 - phenylethylamine under microwaves irradiation	Journal of Chemical Technology and Biotechnology	2011, 86(5), 739-748	2.738
2	Kinetic modeling and Statistical Optimization of Lipase CatalyzedEnantioselective resolution of (RS)-2-pentanol	Industry Engineering and Chemistry Research	2011, 50, 12975-12983	2.98
3	Optimization of Chiral Resolution of (R,S)-1-Phenylethanol by Statistical Methods	International Journal of Chemical Reactor Engineering	2011, 9, A77, 1-15	0.759
4	Optimization and kinetic modeling of lipase catalyzedchiral resolution of 2-octanol in non-aqueous media	Natural Science	2013, 5(9), 1025-1033	0.52
5	Microwave Assisted Synthesis of Ethyl 2-(4-aminophenyl) Acetate using Novozyme 435	Current Catalysis	2014, 3, 27-34	2.64
6	Methods for Separation and Recycling of Biodegradation Products	Biodegradation/ Book 1	InTech, ISBN: 980-953-307-968-9	--
7	Viridiplantae: Holistic Approach for Food Security and Environmental Protection in Indian Scenario	Environmental Science and Engineering	Vol 5: Municipal Solid Waste, Pg 290-308	--

DR. SNEHASIS CHAKRABORTY

B.sc.,B.Tech., M. Tech, Ph. D (Food Process Engg.)

Assistant Professor, Food Technology

SUBJECTS TAUGHT

Food engineering, advances in food engineering, current topics in food science and technology and technology of plantation crops food analysis lab, food processing lab I

RESEARCH INTERESTS

Food Process Engineering, Nonthermal processing of food, Kinetics modeling, Shelf-life extension, Sensory analysis, Process optimization

RESEARCH STUDENTS

Ph.D. (ongoing) – 06

Masters (ongoing) – 08

Masters (completed) – 06

RESEARCH PUBLICATIONS

International - 25

International (this year) - 06

Book / Monograph- 1

Book chapter: 6

Peer-reviewed- 25

H-INDEX: 8*

citations: 339*(Since 2014)

HIGHLIGHTS OF RESEARCH WORK DONE AND ITS IMPACT

Dr. Snehasis Chakraborty is working as an Assistant Professor in Department of Food Engineering and Technology, Institute of Chemical Technology, Mumbai since October 2015. Dr. Snehasis Chakraborty is a young academician working on processing of fruit beverages and mathematical modelling of food quality parameters affected by processing parameters. He was the Institute Silver Medalist and Departmental topper in Department of Agricultural & Food Engineering, IIT Kharagpur during his master's in Food Process Engineering. He had hands on experience on processing of fruit beverages at Germany through DAAD Fellowship. His PhD thesis on high pressure processing of pineapple puree conducted at IIT Kharagpur received the Jawaharlal Nehru Outstanding Thesis 2017 by ICAR, India. He has published 25 referred research papers, one book, 6 book chapters. He served as an expert reviewer in National Science Centre (Narodowe Centrum Nauki - NCN), Poland. In addition, he also served as an expert reviewer of international journals from Elsevier, Springer and Wiley. His research area focusses on nonthermal processing of food. His research team basically focus on developing fruit beverages and the kinetic modeling under different treatment conditions like thermal treatment and pulsed light processing.

TEN BEST REPRESENTATIVE PUBLICATIONS/PATENTS

Sl. No	Author	Title	Journal	Vol	Page	Year	Impact Factor
1	Chakraborty, S., Kaushik, N., Rao, P.S., & Mishra, H.N.	High-pressure inactivation of enzymes: A review on its recent applications on fruit purees and juices.	Comprehensive Reviews in Food Science and Food Safety	13(4)	578-596	2014	4.903
2	Chakraborty, S., Baier, D., Knorr, D., & Mishra, H.N.	High pressure inactivation of polygalacturonase, pectinmethylesterase and polyphenoloxidase in strawberry puree mixed with sugar.	Journal of Food and Bioproducts Processing	95	281-291	2015	2.687
3	Chakraborty, S., Rao, P.S., & Mishra, H.N.	Kinetic modeling of polyphenoloxidase and peroxidase inactivation in pineapple (Ananascomosus L.) puree during high pressure and thermal treatments.	Innovative Food Science and Emerging Technologies	27	57-68	2015	2.997
4	Chakraborty, S., Rao, P.S., & Mishra, H.N.	Effect of combined high pressure-temperature treatments on color and nutritional quality attributes of pineapple (Ananascomosus L.) puree	Innovative Food Science and Emerging Technologies	28	10-21	2015	2.997
5	Chakraborty, S., Rao, P. S., & Mishra, H. N.	Response surface optimization of process parameters and fuzzy analysis of sensory data of high pressure-temperature treated pineapple puree.	Journal of Food Science	80(8)	E1763 - E1775	2015	1.649
6	Chakraborty, S., Rao, P.S., & Mishra, H.N.	Empirical model based on Weibull distribution describing the destruction kinetics of natural microbiota in pineapple (AnanascomosusL.) puree during high-pressure processing.	International Journal of Food Microbiology	211	117-127	2015	3.445
7	Jayachandran, L. E., Chakraborty, S., & Rao, P. S.	Effect of High Pressure Processing on Physicochemical Properties and Bioactive Compounds in Litchi based Mixed Fruit Beverage	Innovative Food Science & Emerging Technologies	28	1-9	2015	2.997

8	Chakraborty, S., Rao, P.S., & Mishra, H.N.	Changes in quality attributes of high pressure and thermally processed pineapple (AnanascomosusL.) puree during storage	Food and Bioprocess Technology	9(5)	768-791	2016	2.574
9	Chakraborty, S., Rao, P.S., & Mishra, H.N.	Modeling the inactivation kinetics of fruit bromelain in pineapple during high-pressure and thermal treatments	Innovative Food Science and Emerging Technologies	33	10-18	2016	2.997
10	Jayachandran, L. E., Chakraborty, S., & Rao, P. S.	Inactivation kinetics of the most baro-resistant enzyme in high pressure processed litchi based mixed fruit beverage	Food and Bioprocess Technology	9(7)	1135-1147	2016	2.574

VISITING FACULTY

B.TECH (FOOD ENGINERING AND TECHNOLOGY)

- Dr. Jayant R. Bandekar, D 1801,Runwal Center, Opp. ICICI Bank, Deonar, Mumbai – 400 088.
- Dr. Shruti Baadkar, 259/10187, Sagar-Sangeet, Kannamwar nagar-1, Vikhroli (E), Mumbai – 400 083
- Dr. Subha Nishtala, F-102, Oberoi Splendor, JVLR, Andheri (E), Mumbai – 400 060.
- Dr. Shyam Asolkar, Prof. Indian Institute of Technology, CEST, Powai, Mumbai – 400076.
- Dr. Hormaz Patwa, Technical Executive, Sensient India Pvt. Ltd., Powai, Mumbai.
- Ms. Swati Deodhar Singh, c/o Sonia Kharapurkar, Flat No. 402, Aakansha Building, Vishnu Nagar, Naupada, Thane (W) – 400 602
- Dr. Rahul Sutar,IIT, Bombay
- Dr.Ravindra Zende, Prof. & Principal Investigator, Dept. of Vaterinary Public Health, Bombay Vaterinary College, Parel, Mumbai-400012.
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M.TECH. (FOOD ENGINEERING AND TECHNOLOGY) AND (FOOD BIOTECHNOLOGY)

- Dr. Subha Nishtala, F-102, Oberoi Splendor, JVLR, Andheri (E), Mumbai – 400 060.
- Dr. Veena Yardi, Associate Professor, College of Home Science, Nirmala Niketan, Mumbai
- Dr. Shantanu Samant, Thane Technical centre, Mondelez India foods Pvt. Ltd. Off. Eastern express Highway, 1st Pokhran Road, thane (W), - 400 606
- Dr.Sagar Gokhale
- Dr. Jyoti Baliga, D-502, Shankardhan Plaza, Jawaharlal Nehru Road, Mulund(W), Mumbai-400 080

SUPPORT STAFF

Sagarika Jadhav
Laboratory Technician

Sangita R. Dhakne
Laboratory Assistant

Chitra K. Koli
Laboratory Assistant

Shashikant Magdum
Laboratory Assistant

Ganesh S. Bhagat
Laboratory Attendant

Santosh J. Rajam
Laboratory Attendant

Pramila P. Pawar
Laboratory Attendant

Rupesh Alim
Laboratory Attendant

MAJOR AWARDS / HONOURS

- Prof. R.S.SinghalReceived Fellow (FIBA) of the International Bioprocessing Association-An International Forum on Industrial Bioprocesses Award on May 2019 at Miri, Malaysia.
- Prof. R.S.SinghalReceived Professor D.V. Rege–AFST Mumbai Chapter–2011 Endowment for Best Teacher Award 2018.
- AFST(I) Fellowship Award- 2018
- Vasvik Award- 2018
- Unch Maza Zoka - Zee Marathi National Award- 2016
- UDCT Alumni Association Distinguished alumni Award under Academics- 2015
- Fellow BRSI- 2010
- Fellow Maharashtra Academy of Sciences- 2006
- Dr. Snehasis Chakraborty Received DAAD Fellowship underRe-invitation program of former DAAD scholarship holders in MAY 2018.
- Top 1% reviewer in Agriculture Science given by Publons Global Peer Review Award 2018.
- Best PhD Thesis award in Agricultural Engineering across the country given by Indian council of Agricultural Research in JUNE 2017.
- Institute Silver medallist and Departmental topper in 2010-2012 in Agricultural & Food Engineering Department, Kharagpur in JULY 2012.

UNDERGRADUATE AND POSTGRADUATE SEMINARS & PROJECTS

As a part of the curriculum, every student of final year B.Tech student and first year M.Tech student presents a specific technical topic and submits a written review in the form of a seminar. The faculty members of FETD actively participate in guiding the undergraduate (B. Tech.) and postgraduate (M. Tech.) students for their seminars, project reports and other curricular activities which are tabulated below:

(* Indicates women student)

Sr. No.	Student	Title	Guide
B. TECH. (FOOD ENGINEERING & TECHNOLOGY) SEMINARS			
1.	Joseph Roshan	Amino acids as food supplements	R.S.Singhal
2.	Chaitanya Phadke	Human milk oligosaccharides	R.S.Singhal
3.	Dhelriya Ankit	Recent Advances in applications of Nanotechnology in foods	J.S.Gokhale
4.	Shreya Motwani	Milk and milk bioactives: processing and preservation techniques	S.S.Arya
5.	Claudia Samuel	Fortification of Human Milk	U.S.Arya
6.	Krupa Dhurve	Biosensors to detect the chemical contaminats in foods	J.S.Gokhale
7.	Gore Nikhilesh	Novel Environment Friendly Processes for Extraction of Bioactives from Fruits and Vegetables	S.S.Arya
8.	Tupe Vismay	Ecofriendly alternatives to plastics in food packaging	J.S.Gokhale
9.	Kharbanda Manjot singh	Nutraceuticals- Bioavailability, Efficacy & Safety	L.Anathnarayan
10.	Somnath Basak	Process Control in Baking of bread	S.Chakraborty
11.	Badiger shivani	Pressure Change Technology	S.Chakraborty
12.	Suryawanshi Sandeep	Microplastics in food and food chains	R.S.Singhal
13.	Suryawanshi Tejas	Emerging technologies for extraction of proteins from plant sources	L.Anathnarayan
14.	Wadhe Ankita	Honey Processing and Preservation	U.S.Annapure
15.	Erande Onkar	Multiway analysis	S.Chakraborty
16.	Ruchira Gangurde	Novel non thermal techniques for preservation of sensitive food bioactives in liquid foods.	S.S.Arya
B. TECH. (FOOD ENGINEERING & TECHNOLOGY) PROJECT			
1.	Joseph Roshan	Development of Functional Wheat bread with fermented legume flour	S.Chakraborty
2.	Chaitanya Phadke	Process development of Oxindoles	V.N.Telvekar
3.	Dhelriya Ankit	Osmotic dehydration of ginger cubes	R.S.Singhal
4.	Shreya Motwani	MTBE synthesis	G.D.Yadhav
5.	Claudia Samuel	Synthesis of Edible coatings	J.S.Gokhale
6.	Krupa Dhurve	Synthesis of universal adhesive having layer on layer morphology	R.N.Jain
7.	Gore Nikhilesh	Synthesis of Edible coatings	J.S.Gokhale
8.	Tupe Vismay	Osmotic dehydration of ginger cubes	R.S.Singhal
9.	Kharbanda Manjot singh	Value added products from Rosemary extract	C.S.Mathpathi
10.	Somnath Basak	Advanced processing of Fruit Beverages: Process Optimisation and Shelf-life extension	S.Chakraborty
11.	Badiger shivani	Advanced processing of Fruit Beverages: Process Optimisation and Shelf-life extension	S.Chakraborty
12.	Suryawanshi Sandeep	Development of Functional Wheat bread with fermented legume flour	S.Chakraborty
13.	Suryawanshi Tejas	Functional Seasoning by Coextraction of Bioactives	R.S.Singhal
14.	Wadhe Ankita	Functional Seasoning by Coextraction of Bioactives	R.S.Singhal
15.	Erande Onkar	FO as a means of producing brine for solvay process	A.V.Patwardhan
16.	Ruchira Gangurde	To design a plant for synthesis of 2-amino pyrimidine.(key intermediate in synthesis of sulfadiazine)	SVJ
M.TECH. (FOOD ENGINEERING & TECHNOLOGY) SEMINARS			
1.	Akash kshirsagar	Novel technologies for processing and preservation of liquid eggs	S.S.Arya
2.	Anjali barela	Breakthrough technology for utilization of solid and liquid food waste	S.S.Arya
3.	Annapoorna R.P.	Diet, Gut microflora and Human Health	L.Anathnarayan
4.	Ashutosh rai	Acylated anthocyanins as food colours	R.S.Singhal
5.	Bharati bhagat	Perchlorate as food contaminant	R.S.Singhal
6.	Datla Nishita	Newer developments in maternal and infant nutrition	L.Anathnarayan
7.	Johnsy K J	Obesity, prevalence causes, health effects and treatments	L.Anathnarayan
8.	Mohit Kumar	Natural pigments for from fruits & vegetables: Chemistry, technology, processing & functional health benefits	S.S.Arya
9.	Muhammad Salman Chukkan	Non-thermal processing of fruit juices: An inactivation kinetics of enzymes & microbes	S.S.Arya
10.	Nachal N	Immunomodulatory polysaccharide in food	R.S.Singhal
11.	Nishank Waghmare	Electrodynamics drying in food products	S.Chakraborty
12.	Nissy Mary Prasad	High moisture extrusion	U.S.Annapure
13.	Rupali Katekhaye	Newer developments in smart packaging	L.Anathnarayan
14.	Shubham Mishra	Design of ohmic heater for food products	S.Chakraborty
15.	Sukitha A	Revisiting the concept of Weibull model in thermal processing	S.Chakraborty
16.	Taniya Jha	Geriatric Nutrition: Physiological and Nutritional challenges	R.S.Singhal
17.	Vigneshwaran G	Rheological properties of food gums	U.S.Annapure
18.	Kavya Sood	Integrated approach to mango processing	U.S.Annapure
M.TECH. (FOOD BIOTECHNOLOGY) SEMINARS			
1.	Aayushi Pal	Non thermal technologies in applied pineapple juice processing	SC
2.	Chirag Anandi	Applications of probiotic and prebiotic ingredients in various food systems	SSA
3.	Logesh V N	Biogenic amines in fermented foods	USA
4.	Mohammad Shahrukh	Recent genetic modification in vitamin deficient foods	GDY
5.	Mona Kokwar	Utilization of agricultural waste in production of biopolymer	JG
6.	Seshadrinathan Shruthy	Saccharification of lignocellulose obtained from fruit and vegetable wastes for various food applications	RSS
7.	Srutee Rout	Inactivation of fruit enzymes by pulsed light	SC
8.	Varad Bende	Quorum sensing in food spoilage and fermentation	LA
9.	Zumismita Kalita	Food derived bioactive peptides	JG

M. TECH. (BIOPROCESS TECHNOLOGY)			
1.	Reshma D.Dharade*	Green surfactant from sustainable sources	JG
2.	Anand Krishna	Microbial oil recovery	GDY
3.	Divya*	Production of ligin from chemical source	USA

RESEARCH TOPICS (THESIS WORK)

Ph.D. (TECH.)

[FOOD ENGINEERING AND TECHNOLOGY (FET)/ FOOD BIOTECHNOLOGY (FBT) / BIOPROCESS TECHNOLOGY (BPT)]

Sr. No.	Research Scholar & Sponsors	Previous Institute	Project Title	Date of Registration	Guide
1.	Jadhav Manisha* (UGC SAP)	SLIET, Punjab	Development of extruded food products based on sorghum (FET)	Sept 2010	U. S. Annapure
2.	Bawane Amruta* (UGC SAP)	SLIET, Punjab	Studies on stability of added constituents during extrusion (FET)	April 2014	R. S. Singhal
3.	Giri Shital* (UGC SAP)	LIT, Nagpur	Studies in development of low glycemic index foods (FET)	June 2011	L. Ananthanarayan
4.	Tupe Rupesh (UGC SAP)	ICT, Mumbai	Studies on functional foods (FET)	October 2012	L. Ananthanarayan
5.	K. V. Umesh (UGC SAP)	ICT, Mumbai	Enhancing bioavailability of nutraceuticals (FBT)	December 2012	R. S. Singhal
6.	Regubalan Baburaj	Anna University, AICT Campus, Chennai	Studies in microbial characterization, nutritional improvement and preservation of idli batter (FET)	September 2013	L. Ananthanarayan
7.	Desai Mihir Mukund	UICT, NMU, Jalgaon	Studies on indigenous oils and deoiled meals (FET)	September 2013	S. S. Lele
8.	Bhushette Pravin Rajkumar	UICT, NMU, Jalgaon	Study on new exudate gums (FET)	October 2013	U. S. Annapure
9.	Nagavekar Nupur Shantaram*	ICT, Mumbai	Extraction technologies for novel food ingredients (FBT)	May 2014	R. S. Singhal
10.	Sorde Karuna Liladas*	UICT, NMU, Jalgaon	Studies in fermentative production of microbial Transglutaminase (FBT)	October 2013	L. Ananthanarayan
11.	Singhu Bhupender	Shri Ramaswami Memorial University, Chennai	Enhanced production of glutathione (FBT)	October 2013	U. S. Annapure
12.	Tulamandi Sreedath	TNAU/Cornell University joint degree	Development of biopolymer films using agricultural biomass	January 2014	R. S. Singhal
13.	Chaudhari Bhushan	North Maharashtra University, Jalgaon	Study on new seed gums(FET)	April 2015	U. S. Annapure
14.	Ketan Mulchandani	ICT, Matunga	Studies on production and downstream processing of Deoxynojirimycin (BPT)	March 2017	R. S. Singhal
15.	Abhijit Muley	North Maharashtra University, Jalgaon	Modification of proteins for enhanced functionality(FBT)	September 2015	R. S. Singhal
16.	Seema Bajaj*	ICT, Matunga	Processing and storage stability of added vitamins in food(FET)	September 2015	R. S. Singhal
17.	Sachin Adsare	North Maharashtra University, Jalgaon	Studies in coconut processing (FBT)	April 2015	U. S. Annapure
18.	Anu Ahlawat* (DST-INSPIRE)	GGS Indraprasth University	Studies in development of milk based beverages(FBT)	Sept 2016	L. Ananthanarayan
19.	Sowmya R. S.*	Karunya university, coimbatore	Studies on extractions and characterization of phytonutrients from hydroponically grown plants and their application in health food(FET)	Dec 2016	U. S. Annapure
20.	Aratrika Ray* (DST-INSPIRE)	Sam Higginbotlom university of Agriculture, Technology & Science, Allahabad,	Development of polysaccharide aerogels from arabinoxylans extracted from different plantsources and their application in encapsulation(FET)	July 2017	R.S. Singhal
21.	Prasanna Bhalerao	UICT, NMU, Jalgaon	Non thermal processing of fruit beverages(FET)	November 2018	S. Chakraborty
22.	Abhinav Sharma (DST-INSPIRE)	Aasam Universtiy	Co-extraction of bioactive components using green technology process optimization and evaluation of bioactive potential(FET)	Aug 2018	R.S. Singhal
23.	Manoj Dev (PM FELLOW)	NIPER, Punjab	In Process(BPT)	Aug 2018	R.S. Singhal
24.	Prajakta Sadavarte	Dr. B.S.K.K.V Dapoli, Ratnagiri	Development of Sesame based Functional foods. (FS)	Feb 2016	U. S. Annapure

25.	KaKoli Pegu* (DST-SERB)	ICT, Mumbai	Novel, non-thermal energy efficient processing of milk by hydrodynamic cavitation and enhanced shelf life study (FET)	Jan 2019	S.S.Arya
26.	Pavankumar R More (TEQIP-III)	UICT, NMU, Jalgaon	Novel, green,energy efficient cloud point extraction of bioactive compounds from fruit industry waste (FET)	Oct 2018	S.S.Arya
Ph.D. SCIENCE [BIOTECHNOLOGY (BT)/ BIOCHEMISTRY (BC)/ FOOD SCIENCE (FS)]					
1.	Subramaniam Jayshree* (UGC SAP)	Ruia College, Mumbai	Fermentative production and downstream processing of fucoxanthian (BT)	Aug 2010	R. S. Singhal
2.	Bagul Vaishali *(UGC SAP)	KTHM College, Nashik	Studies in fermentative production and downstream processing of docosahexanoic acid (BT)	August 2013	U. S. Annapure
3.	Ghanate Aarti * (UGC SAP)	Shivaji University, Kolhapur	Studies in traditional foods: process and technology development (FS)	December 2012	U. S. Annapure
4.	Bhagwat Ashlesha * (UGC SAP)	K.J. Somaiya College, Mumbai	Studies in probiotics (BT)	December 2012	U. S. Annapure
5.	Bannerji Anamika Amit *	SNDT University, Mumbai	Indian flat breads: physicochemical and nutrituional aspects (FS)	September 2013	S. S. Lele
6.	Janve Madhura Pramod*	University of Mumbai	Chelates of iron with amino acids and sugars for improved bioavailability and stability (FS)	September 2013	R. S. Singhal
7.	Bakshi Gayatri Girish*	University of Mumbai	Studies in pectinase enzymes and associated inhibitors in selected fruits (FS)	September 2013	L. Ananthanarayan
8.	Salve Akshata Raosaheb*	University of Mumbai	Development of peanut based functional foods (FS)	September 2013	S. S. Arya
9.	Dash Pratipanna*	University of Mumbai	Studies on enzymatic protein hydrolysis and characterization of protein hydrolysates (BC)	October 2013	L. Ananthanarayan
10.	Pathan Fayaz Latif	MPKV, Rahuri	Studies on effect of plasma processing on physicochemical properties of legumes (FS)	May 2014	U. S. Annapure
11.	Sandesh Marathe	Furgusson College, Pune	Enzymatic biotransformation of sugars and polyphenols for enhanced functionality(BT)	November 2017	R. S. Singhal
12.	Amruta Karangutkar*	Khalsa College, Matunga	Studies on extraction, purification, characterization & stabilization of natural pigments(FS)	September 2015	L. Ananthanarayan
13.	Santosh Pradhan	Mumbai University, Kalina	Detection and degradation of AFB, in food commodities and products(BC)	April 2017	L. Ananthanarayan
14.	Mohmad Sayeed Bhat	SLIET, Punjab	Studies on Horse chestnut, water chestnut and gorgon nut: utilization and their processing(FS)	March 2015	S. S. Arya
15.	Suman kumari* (UGC NET JRF)	Delhi University	Composition studies on human milk among Indian mothers(FS)	Sept 2016	U. S. Annapure
16.	Anusha Mishra*	Punjab Agricultural University, Ludhiana	Studies in low glcemic index extruded products (FS)	Oct 2017	U. S. Annapure
17.	Suraj P. Kahar	S.I.E.S College, Mumbai	In process(BT)	Jan 2018	U. S. Annapure
18.	Pratisha Nair*	Ruia College, Matunga	Development of a probiotic formulation to treat metabolic disorders(BT)	Oct 2018	U. S. Annapure
19.	Shilpa Jana*	Sambalpur university, Odisha	Bitterness and debittering of selected herbal plants and their bioactivities (FS)	Sept 2018	R. S. Singhal
20.	Saurabhi Ghag*	University of Mumbai	In process (BT)	April 2019	S.S. Lele
M.TECH. (FOOD ENGINEERING & TECHNOLOGY)					
1.	Aditi Runga	University of Delhi	Development of quick cooking food products	Aug, 2018	L. Anathnarayan
2.	Admajith Kaimal	National institute of food technology entrepreneurship & management	Monitoring of oil quality in fried foods	Aug,2018	R.S.Singhal

3.	Madan Dhulgande	Vasantrao Naik agriculture university, Parbhani	Studies in development of instant gravy	Aug.2018	L. Anathnarayan
4.	Megha Dhingra	University of Delhi	Monitoring of oil quality in fried foods	Aug,2018	R.S.Singhal
5.	Naveen Kumar Shakya	Tezpur university	Development of minor millet based functional foods	Aug,2018	S.S.Arya
6.	Oildrila Ghosh	WBUT	Extraction of bioactive compounds from agro-industrial waste using plant oil	Aug,2018	S.Chakraborty
7.	Prateek Katariya	National institute of food technology entrepreneurship & management	Hydrodynamic cavitation of orange juice	Aug,2018	S.S.Arya
8.	Sagar Mahale	Mahatma Phule Krishi Vidyapeeth	Pulse light treatment of under utilized fruits	Aug,2018	S.Chakraborty
9.	Sujay Ayachit	R.T.M.N.U	Modification of ceiba pentandra (KAPOK) gum	Aug,2018	U.S.Annapure
10.	Omkar Sawant	Mahatma Phule Krishi Vidyapeeth	Modification of tree exudates of moringa oleifera	Aug,2018	U.S.Annapure
11.	Saee Nikam*	S.P. college of food technology, Dahivali	Raw and ripe jackfruit utilization	Aug,2018	S.S.Lele
12.	Dipak Gujar	Dr.Balasaheb Sawant Konkan Krishi Vidyapith	Waste utilization for food industry	Aug,2018	S.S.Lele
M. TECH. (FOOD BIOTECHNOLOGY)					
1.	Abdur Rehman Moh. Kalim Khan	Mumbai University	Production of microbial lipopetide & its food application	Aug,2018	S.Chakraborty
2.	Bisal prasher	Jaypee university of Information Technology	Process intensification in the formation of fruity flavor esters	Aug,2018	G.D.Yadhav
3.	Deep kamal Dave	D.Y.Patil university, School of Biotechnology & Bioinformatics	Probiotics to paraprobiotics: enumeration, inactivation kinetics & bioactivity	Aug,2018	R.S.Singhal
4.	G V Lathika	Mumbai University	Isolation of indigenous microorganisms for food products	Aug,2018	S.S.Lele
5.	Shreyasi phatak	Mumbai University	Complete utilization of cashew apple	Aug,2018	S.S.Lele
6.	Shriya Das	Gauhati University	Sourdough bread from minor millets	Aug,2018	S.S.Arya
7.	Sneha Kamble	Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur	Studies on utilization of roasted jackfruit seeds	Aug,2018	J.S.Gokhale
8.	Stuti Agarwal	Jaypee university of Information Technology	Utilization of industrial waste for production of value added products	Aug,2018	U.S.Annapure
9.	Sudharshini B.	Anna University	Extraction of pigments from natural sources	Aug,2018	L.Anathnarayan
M.TECH (BIOPROCESS TECHNOLOGY)					
1.	Nitesh Punde	Sinhgad institute of pharmacy, Pune	Fermentative production, extraction and characterization of selenoprotein from saccharomyces boulardi	Aug,2018	U.S. Annapue
2.	Pooja Motikar	University department of pharmaceutical sciences, Nagpur	Novel green environment friendly cloud point extraction of polyphenols from pomegranate peels-a comparative assessment for efficacy and antioxidant activity	Aug,2018	S.S. Arya
3.	Priyanka Nakka	MET, Bandra	Vegetable juice fermentation using probiotic lactic acid bacteria	Aug,2018	J.S.Gokhale
4.	Ratnamala Marathe	Maeer's Maharashtra institute of pharmacy, Pune	Fermentative production, extraction, and characterization og phytase enzyme from saccharomyces boulardi	Aug,2018	U.S. Annapure
M.TECH (PURFUMERY & FLAVOUR TECHNOLOGY)					
1.	Prasad Gaikwad	College of Food Technology, Parbhani	Studies in development of natural process flavour	Aug,2018	U.S.Annapure

POST-DOCTORAL FELLOWS RESEARCH PROJECTS

Sr.	Post-Doctoral Fellow	Previous Institute	Project Title	Guide
1.	Kriti Kumari Dubey*	University of Mumbai	Microbial fermentation of Tea	R. S. Singhal
2.	Hemant P. Borse	North Maharashtra university, Jalgaon	Toxicological evaluation of chemically & biologically synthesized nanoparticles	R. S. Singhal
3.	Chhanwal Narayasing	CFTRI, Mysore	Development of Micronutrient Delivery Vehicle by Co-crystallization with Sucrose and Trehalose	R. S. Singhal

DEGREES AWARDED

Sr.	Name of the Student	Title	Guide
M. TECH. (FOOD ENGINEERING & TECHNOLOGY)			
1.	Abisheka Pandian T.	Quality monitoring of paneer using TTI during cold storage	S.Chakraborty
2.	Harshal*	Novel products from fruit seeds	S.S.Lele
3.	Kakoli Pegu*	Effect of processing on bioactive compounds of fruit & vegetable	S.S.Arya
4.	Kapil Rai	Flavoured sugar cubes with ginger	R.S.Singhal
5.	Kishori Balu Panmand*	Development & preservation of sugar free confectionary	L. Ananthnarayan
6.	Krutika Anil Bhangale*	Modification of non-commercial gums using cold plasma treatment	U. S. Annapure
7.	Nivedita N.V.*	Effect of cold plasma on oil	U. S. Annapure
8.	Rishab Dhar	Beverage from underutilized tropical fruits: value addition, process optimization and shelf life extension	S.Chakraborty
9.	Shubham Goyal	Bitterness mashing of momordica chavantia linn(bitterguard) by microencapsulation of bitterguard juice using spray drying method	S.S.Arya
10.	Sneha Awasthi*	Osmotically dehydrated ginger candy	R.S.Singhal
M. TECH. (FOOD BIOTECHNOLOGY)			
1.	Alisha Sukhija*	Mead production from honey fermentation	U. S. Annapure
2.	Harsha Jagdish Bharwani*	Effect of processing on allergens of whitepeas and their analysis	S.S.Arya
3.	Mukesh Kumar Patel	Production & characterization of dextran by L.mesentericoles using tomato juice with sucrose	S.Chakraborty
4.	Nitin Sukhdev Sangle	Development of functional food product using fermented fungri seed flour	J.S.Gokhale
5.	Prabhat Chauhan	Medicinal important metabolites from S. boulardii	U. S. Annapure
6.	Sana Jameel Shaikh*	Development of dry naturally leavened Idli premixes with accelerated fermentation	L. Ananthnarayan
7.	Shaikh Lubna Bagum*	Studies on fruit wines from plant material	S.S.Lele
8.	Shraddha Srinivasan*	Screening and evalution of food commodities for their anti hangover effect	R.S.Singhal
9.	Shubham Bharat Gaikwad	Bioactives from fish waste	S.S.Arya
10.	Sumita Kumari*	Study of cajanus cajan and lathyrus satires using molecular biology techniques	L. Ananthnarayan
M.TECH. (BIOPROCESS TECHNOLOGY)			
1.	Vaibhav Kalokhe	Fermentative production of inulinase from saccharomyces boulardii	U. S. Annapure
2.	Niddhi Kulkarni*	Immobilization & acrylamidase enzyme using crosslinkers	R.S.Singhal
3.	Vasudha Borkar *	Production, purification and characterization of naringinase from aspergillus niger van tieghem using citrus solid waste	J.S.Gokhale
4.	Shyam Mewada	Development of functional probiotic beverage from Beet-root and tomato	S.S.Arya
M.TECH. (GREEN TECHNOLOGY)			
1.	Ankita Gavas*	Biosorption of heavy metals using dried coconut leaves	J.S.Gokhale
Ph.D. (TECH) [FOOD ENGINEERING AND TECHNOLOGY (FET)/ FOOD BIOTECHNOLOGY (FBT)/ BIOPROCESS TECHNOLOGY (BPT)]			
1.	Bhaskar Bincy* (DBT)	Studies on bioactive peptides from selected legumes commonly consumed in India (FBT)	L. Ananthnarayan
2.	Shweta Deshaware *(DBT)	Study on genetic polymorphism of TAS2R38 bitter taste receptor gene in an Indian population and approaches for debittering of glycosides (FBT)	R.S.Singhal
3.	Shah Nirali Nitin*	Hydrophobic modification of biopolymers (FET)	R.S.Singhal
4.	Bedade Dattatray Kashinath	Fermentative production, downstream processing and applications of acrylamidase (BPT)	R.S.Singhal
5.	Kadam Deepak	Studies on utilization of Nigella sativum and Lepidiumsativum seed cake (FBT)	S. S. Lele
6.	Patil Sonal* (UGC SAP)	Studies on production and characterization of gluten-free flat bread (FET)	S. S. Arya
7.	Waghmare Aashish (UGC SAP)	Extraction of bio-oil and valuable products from microalgae (BPT)	S. S. Arya
8.	Gaikwad Sonali* (UGC-SAP)	Chemistry and technology of cereal-legume based Indian traditional food (FET)	S. S. Arya
Ph.D. SCIENCE (BIOTECHNOLOGY)			
1.	Insulkar Prajakta* (UGC SAP)	Study of production of exopoly saccharide from haloroterant organisms and their biotechnological application (BT)	S. S. Lele
2.	Jamakhani Majeed (UGC SAP)	Study on isolation and characterization of tomato allergens (BT)	S. S. Lele
3.	Rahman Momin Bilal M. (UGC SAP)	Fermentative production and dowmnstream processing of arginase (BT)	U. S. Annapure
4.	Vaidya Aniruddha (UGC SAP)	Development of phage-based biosensor (BT)	U. S. Annapure
Ph.D. SCIENCE (BIOCHEMISTRY)			
1.	Deorukhkar Anuradha *(UGC SAP)	Biochemical studies and characterization of isoflavones occurring in commonly consumed Indian legumes (BC)	L. Ananthnarayan
2.	Amane Dhanashree * (UGC SAP)	Development of biochemical methods for detection of adulteration in legume-based traditional food products (BC)	L. Ananthanarayan

SPONSORED PROJECTS

PROF. R.S. SINGHAL

Sr.	Project Title	Sponsoring Agency	Budget	Status
2	Optimization of process parameters for astaxanthin extraction using Supercritical CO_2	Reliance Industries Limited, India	3.50 lakhs	December 2018 -September 2019
3	Centre of Advanced Studies-Phase II	UGC, New Delhi	206 lakhs	Ongoing: April 2018 to March 2023
5	Anti-hangover ingredients: Understanding the mode of action and development of the product formulation	THINQ Pharma- CRO Ltd, India	2.73 lakhs	Januray 2018-July 2018

GOVERNMENT AGENCIES

Sponsor	Title	Duration	Amount	Principal Investigator	Co-investigator
RGSTC, Govt. of India	Techno-commercial Viability Studies for Small Scale Fruit Winery	2018-2020	31.76 lakhs	Prof.S.S.Lele	--
DBT	Developing of mushroom germplasma bank for western coast of India with special emphasis on Maharashtra and Goa to commercialize their nutraceutical and pharmaceutical potential	2015-2017	2.7 lakhs	Prof.S.S.Lele	--
RGSTC, Govt. of India	Exotic tropical fruit wines : microbrewery demo plant	2014-2017	67.27 lakhs	Prof.S.S.Lele	--
DST-SERB	Pulse light processing of beverage using under-utilized fruits: value addition, process optimization & shelf life extension	April 2017 – Mar 2020	48 Lakhs	Dr. Snehasis Chakraborty	--
DST-international bilateral co-op division, New Delhi (Indo srilankan joint project)	Studies in surface sterilization of spices using non thermal processing	November 2017-November 2019	26,48,000/-	Prof. U.S.Annapure (India)	Dr. P.N.R.J Amunogoda (Srilanka)
DST-SERB	Novel, non-thermal, energy efficient, industrially scalable hydrodynamic cavitation (HC) processing of milk for enhanced nutrients and shelf life extension	2018-2021	43,06,000/-	Dr.S.S.Arya	--
MOFPI	Novel, non-thermal, energy efficient, industrially scalable hydrodynamic cavitation processing of indigenous fruit juices for enhanced nutritional bioactives and shelf life extension	2018-2020	49,30,560/-	Dr.S.S.Arya	--
CAS II (SAPII)		2018-23	45,00,000/-	Prof.R.S. Singhal	Prof. U.S. Annapure
DST-FIST		2018-23	88,00,000/-	Prof. U.S.Annapure	

PRIVATE AGENCIES

Sponsor	Title	Duration	Amount	Principal Investigator
Bühler India Pvt Ltd, Banglore	Assessment of tur dal quality	2018-19	2,50,750/-	Dr. Shalini S. Arya
Zen Tiger Kombucha, Mumbai	Shelf life and quality study of Kombucha	2018	1,75,000/-	Dr. Shalini S. Arya
Faraway Foods, Mumbai	Development of fruit leathers	2017	2,30,000/-	Dr. Shalini S. Arya
Tata Trust and Government of Maharashtra, Mumbai, India	Usage study of Fortified Wheat and Monitoring	2016-17	3,00,000/-	Dr. Shalini S. Arya
Bühler India Pvt Ltd., Bangalore, India	Physical, chemical, nutritional characterization and product development of besan	2016-17	4,33,125/-	Dr. Shalini S. Arya
Godrej & Boyce Mfg Co Ltd, India	Parametric study and data analysis in the process of developing cooking aids	April - September 2017	2 lakhs	Prof. Uday S. Annapure/Dr. S.Chakraborty
THINQ Pharma CRO. LTD	Anti-Hangover Formulation	17th June 2017-17th December 2017	4.51 lakhs	Prof. R.S.Singhal

DETAILS OF NATIONAL AND INTERNATIONAL COLLABORATIONS

Collaborating University/ Institute	Topic of Investigation	Student
BARC, Mumbai	Studies on bioactive peptides from selected legumes commonly consumed in India	Bhaskar Bincy
BARC, Mumbai	Development of phage-based biosensor	Vaidya Aniruddha
BARC, Mumbai	Study on genetic polymorphism of TAS2R38 bitter taste receptor gene in an Indian population and approaches for debittering of glycosides	Sweta Deshaware
Himedia	Studies on extractions and characterization of phytonutrients from hydroponically grown plants and their application in health food	Sowmya R. S.
National Botanical Research Institute, Lucknow	Plant genomics lab	Anuradha Deorukhkar
Sahyadri educational society, Chiplun	Fruit wine research and training.	Saee Nikam, Deepak Gujar

RESEARCH PUBLICATIONS/BOOK CHAPTER

PROFESSOR REKHA S. SINGHAL

Title	Author	Journal
Effect of extrusion processing and hydrocolloids on the stability of added vitamin B12 and physico-functional properties of the fortified puffed extrudates	Bajaj, S.R., Singhal, R.S.	LWT 101, pp. 32-39 (March 2019)
Chitosan coated calcium alginate beads for covalent immobilization of acrylamidase: Process parameters and removal of acrylamide from coffee	Bedade, D.K., Sutar, Y.B., Singhal, R.S.	Food Chemistry 275, pp. 95-104 (March 2019)

Moina macrocopa as a non-target aquatic organism for assessment of ecotoxicity of silver nanoparticles: Effect of size	Borase, H.P., Patil, S.V., Singhal, R.S.	Chemosphere pp. 713-723 (March 2019)
Dodecenyl succinylated guar gum hydrolysate as a wall material for microencapsulation: Synthesis, characterization and evaluation	Soni, N., Shah, N.N., Singhal, R.S.	Journal of Food Engineering 242, pp. 133-140 (Feb 2019)
Magnetic cross-linked enzyme aggregates of acrylamidase from Cupriavidus oxalaticus ICTDB921 for biodegradation of acrylamide from industrial waste water	Bedade, D.K., Muley, A.B., Singhal, R.S.	Bioresource Technology 272, pp. 137-145 (Jan 2019)
Fortification of puffed rice extrudates and rice noodles with different calcium salts: Physicochemical properties and calcium bioaccessibility	Janve, M., Singhal, R.S.	LWT 97, pp. 67-75 (Nov 2018)
A tri-enzyme co-immobilized magnetic complex: Process details, kinetics, thermodynamics and applications	Muley, A.B., Thorat, A.S., Singhal, R.S., Harinath Babu, K.	International Journal of Biological Macromolecules 118, pp. 1781-1795 (Oct 2018)
Supercritical carbon dioxide extraction of triacontanol from green tea leaves and its evaluation as an unconventional plant growth regulator for spinach tissue culture	Sontakke, S., Nagavekar, N., Dubey, K.K., Singhal, R.	Biocatalysis and Agricultural Biotechnology 16, pp. 476-482 (Oct 2018)
Homology modelling of human divalent metal transporter (DMT): Molecular docking and dynamic simulations for duodenal iron transport	Anantram, A., Janve, M., Degani, M., Singhal, R., Kundaikar, H.	Journal of Molecular Graphics and Modelling 85, pp. 145-152 (Oct 2018)
Debittering of bitter gourd juice using-cyclodextrin: Mechanism and effect on antidiabetic potential	Deshaware, S., Gupta, S., Singhal, R.S., Joshi, M., Variyar, P.S.	Food Chemistry 262, pp. 78-85 (Oct 2018)
Variation in the plasma levels of polyunsaturated fatty acids in control vis-à-vis nonalcoholic fatty liver disease subjects and its possible association with gut microbiome	Vernekar, M., Singhal, R., Joshi, K., Amarapurkar, D.	Metabolic Syndrome and Related Disorders 16(7), pp. 329-335 (Sep 2018)
Biodegradation of acrylamide by a novel isolate, Cupriavidus oxalaticus ICTDB921: Identification and characterization of the acrylamidase produced	Bedade, D.K., Singhal, R.S.	Bioresource Technology 261, pp. 122-132 (Aug 2018)
Synthesis and evaluation of n-octenyl succinylated guar gum as an anti-staling agent in bread	Shah, N.N., Raut, A., Yedage, S.L., Bhanage, B.M., Singhal, R.S.	LWT 93, pp. 368-375 (July 2018)
Evaluation and application of prebiotic and probiotic ingredients for development of ready to drink tea beverage	Tewari, S., Dubey, K. K. and Singhal, R. S.	Journal of Food Science and Technology, 55, pp 1525-1534 (July 2018).
Fermentative production of extracellular amylase from novel amylase producer, Tuber maculatum mycelium, and its characterization	Bedade, D., Deska, Bankar, S. B. Bejar, S., Singhal, R. S. and Shamekh, S.	Preparative Biochemistry and Biotechnology, 48 (6), pp 549-555 (June 2018).
Nano-eco toxicity study of gold nanoparticles on less explored aquatic organism Moina macrocopa: As new versatile ecotoxicity testing model	Borase, H., Muley, A. B., Patil, S. V., and Singhal, R. S.	Environmental Toxicology and Pharmacology, 68, pp 4 - 12 (May 2019).

REVIEW PAPER

Title	Authors	Reference
Improvements in the extraction of bioactive compounds by enzymes	Marathe, S. J., Jadhav, S. B., Bankar, S. B., Dubey, K. K. and Singhal, R. S.	Current Opinion in Food Science, 25: 62-72 (2019).

PROFESSOR S. S. LELE

Title	Author	Journal
Physicochemical and functional properties of chitosan-based nano-composite films incorporated with biogenic silver nanoparticles	Kadam, D., Momin, B., Palamthodi, S., Lele, S.S.	Carbohydrate Polymers 211, pp. 124-132(2019)
Dough browning inhibition of multigrain Indian flatbread (chapatti) using a combination of chemical and microwave treatment	Banerji, A., Ananthanarayan, L., Lele, S.S.	Journal of Food Measurement and Characterization (2019), Volume 13, Issue 1, pp 807–820
Physicochemical and functional properties of ash gourd/bottle gourd beverages blended with jamun	Palamthodi, S., Kadam, D., Lele, S.S.	(2019)
Effect of karwanda (Carissa congesta Wight) and sugar addition on physicochemical characteristics of ash gourd (Benincasahispida) and bottle gourd (Langenaria siceraria) based beverages	Purohit, P., Palamthodi, S., Lele, S.S.	Journal of Food Science and Technology(2019) article in press
Cross-linking effect of polyphenolic extracts of Lepidiumsativum seedcake on physicochemical properties of chitosan films	Kadam, D., Lele, S.S.	International Journal of Biological Macromolecules 114, pp. 1240-1247(2018)
An investigation on the effect of polyphenolic extracts of Nigella sativa seedcake on physicochemical properties of chitosan-based films	Kadam, D., Shah, N., Palamthodi, S., Lele, S.S.	Carbohydrate Polymers 192, pp. 347-355(2018)

BOOK CHAPTERS

Azo dye Discoloration by Fungi, In Fungal Bioremedian, Fundamentals and Applications, CRC Press	M.R Vernekar, J. S Gokhale, S.S Lele	125-172

GENERAL PUBLICATIONS

Title	Authors	Publisher	Place	Year
Shahanpanachya 100 Goshti and OPEN ACCESS SUCCESS- book on carrer selection and Personality Development, 3rd Edition Marathi- English	Prof. SS Lele	Mr. Satish Lele	Mumbai	April -2019

Prof. U. S. ANNAPURE

RESEARCH PUBLICATIONS

Title	Author	Journal
Valorization of mutant Bacillus licheniformis M09 supernatant for green synthesis of silver nanoparticles: photocatalytic dye degradation, antibacterial activity, and cytotoxicity	Momin, B., Rahman, S., Jha, N., Annapure, U.S.	Bioprocess and Biosystems Engineering (Jan 2019) article in press
Bacteriophages for pre- and post-contamination biocontrol of artificial Escherichia coli contamination in carrots	Vaidya, A., Ravindranath, S., Annapure, U.S.	LWT 97, pp. 193-197 (Nov 2018)
Investigation of the cell disruption methods for maximizing the extraction of arginase from mutant bacillus licheniformis (M09) using statistical approach	Momin B., S. chakraborty, U.S.Annapure	Korean Journal of Chemical Engineering 35(10), pp. 2024-2035 (Oct 2018)
Plasma activated water (PAW): Chemistry, physico-chemical properties, applications in food and agriculture	Thirumdas, R., Kothakota, A., Annapure, U., (...), Gatt, R., Valdramidis, V.P.	Trends in Food Science and Technology 77, pp. 21-31(July 2018)

BOOK CHAPTER

Sr. No.	Title of the book / book chapters	Name of the publisher
1	'Role of Enzymes in Pharmaceutical and Biotechnology Industries' in "Enzymes in Food Technology"	Springer, UK
2	'Enzymes in Biosensors for Food Quality' in "Enzymes in Food Biotechnology"	Academic Press, Elsevier, UK

DR. LAXMI ANANTHANARAYAN

RESEARCH PUBLICATIONS

Title	Author	Journal
Green synthesis of silver nanoparticles using sapota fruit waste and evaluation of their antimicrobial activity	C Vishwasrao, B Momin, L Ananthanarayan	Waste and Biomass Valorization, 10 (8), 2353-2363 (2019)
Extruded black gram flour: Partial substitute for improving quality characteristics of Indian traditional snack	L Ananthanarayan, Y Gat, V Kumar, A Panghal, N Kaur	Journal of Ethnic Foods, 5 (1), 54-59 (2018)
Purification, identification, and characterization of novel angiotensin I-converting enzyme (ACE) inhibitory peptides from alcalase digested horse gram flour	B Bhaskar, L Ananthanarayan, S Jamdar	LWT, 103, 155-161(2019)
Effect of enzymatic hydrolysis on the functional, antioxidant, and angiotensin I-converting enzyme (ACE) inhibitory properties of whole horse gram flour	B Bhaskar, L Ananthanarayan, SN Jamdar	Food science and biotechnology, 28 (1), 43-52 (2019)
Rheological and nutritional studies of amaranth enriched wheat chapatti (Indian flat bread)	A Banerji, L Ananthanarayan, S Lele	Journal of Food Processing and Preservation 42 (1), e13361 (2018)
Shelf life improvement of idli batter by addition of mustard essential oil as bio-preservative	B Regubalan, L Ananthanarayan	Journal of food science and technology 55 (9), 3417-3426 (2018)
Changes in ACE inhibitory and antioxidant activities in alcalase treated idli batter and idli after fermentation	B Bhaskar, L Ananthanarayan	Journal of food science and technology 56 (9), 4025-4035 (2019)
Consumption of Decorticated Pulses Ensures the Optimum Intake of Isoflavones by the Urban Indian Population	A Deorukhkar, L Ananthanarayan	Nutrition and cancer 71 (5), 870-880 (2019)
Dough browning inhibition of multigrain Indian flatbread (chapatti) using a combination of chemical and microwave treatment	A Banerji, L Ananthanarayan, SS Lele	Journal of Food Measurement and Characterization 13 (1), 807-820 (2019)
Isolation, screening, and optimization of bacterial strains for novel transglutaminase production	KL Sorde, L Ananthanarayan	Preparative Biochemistry and Biotechnology 49 (1), 64-73 (2019)

DR. S. S. ARYA

RESEARCH PUBLICATIONS

Title	Authors	Journal
Natural sweeteners: Health benefits of stevia	Gandhi, S., Gat,Y., Arya, S. S., Kumar V, Panghal, A.	Foods and Raw Materials, 6(2), 392-402 (2018)
Combined effect of chemical preservative and different doses of irradiation on green onions to enhance shelf life	Memon, N., Gat,Y., Arya,S.S., Waghmare, R.	Journal of the Saudi Society of Agricultural Sciences, (2018)
Nanotechnology enrolment in food and food safety	Sonawane, S.K., Patil, S.P., Arya, S.S.	Journal of Microbiology, Biotechnology and Food Sciences, 8(3), 893-900, (2018)
Cereal based functional beverages: A review	Fernandes, C.G., Sonawane, S.K., Arya, S.S.	Journal of Microbiology, Biotechnology and Food Sciences, 8(3), 914-919 (2018)
Tran, B.X., Van Pham, T., Ha, G.H., Arya S.S.,Ho, C.S.H., Ho, R.C.M.	A bibliometric analysis of the global research trend in child maltreatment	International Journal of Environmental Research and Public Health. 15(7),1456 (2018)
Influence of frozen storage on quality of multigrain dough, par baked and ready to eat thalipeeth with additives	Gaikwad, S., Arya, S.S.	LWT- Food Science and Technology, 96, 350-356, (2018)
Food waste compost as an organic nutrient source for the cultivation of Chlorella vulgaris	Chew, K.W., Chia, S.R., Show, P.L., (...), Arya, S.S., Chang, J.-S.	Bioresource Technology, 267, 356-362, (2018)
Limonia acidissima and Citrullus lanatus fruit seeds: Antimicrobial, thermal, structural, functional and protein identification study	Sonawane, S.K., Bhagwat, A.N., Arya, S.S.	Food Bioscience, 26, 8-14. (2018)
Novel, energy efficient and green cloud point extraction: technology and applications in food processing	Arya, S.S., Kaimal, A.M., Chib, M., Sonawane, S.K., Show, P.L.	Journal of Food Science and Technology, 56(2), 524-534, (2019)

Characterization of gluten free flatbread: quality improvement by the addition of hydrocolloids and emulsifiers using simplex centroid design.	Patil, S., Arya, S.S.	Journal of Food Measurement and Characterization, 13(1), 821-830, (2019)
A review on microbial alkaline protease: An essential tool for various industrial approaches	Sharma, M., Gat, Y., Arya, S.S., Panghal, A., Kumar, A.	Industrial Biotechnology, 15(2), 69-78, (2019)
Influence of additive premix, whey proteins, extruded and germinated flour on gluten free dough rheological parameters and flatbread characteristics: A mixture design approach.	Patil, S.P., Arya, S.S.	Journal of Microbiology, Biotechnology and Food Sciences, 8(5),1198-1204, (2019)

BOOK CHAPTERS

Title	Authors	Book and Publication
Quinoa	S.S. Arya, Kakoli Pegu (2019).	Chapter 8, Quinoa, pp 151-172 inWhole Grains-Processing, Product Development, and Nutritional Aspects, CRC Press,Taylor and Francis Group, (2019)
Buckwheat	S.S. Arya, Kakoli Pegu (2019).	Chapter 8, Quinoa, pp 151-172 inWhole Grains-Processing, Product Development, and Nutritional Aspects, CRC Press,Taylor and Francis Group, (2019)

Dr. JYOTI S. GOKHALE

BOOK CHAPTERS

Title	Authors	Reference
Azo dye decoloration by Fungi	Vernekar, M.R., Gokhale, J.S., & Lele, S.S.	A Tomasini, HH Leon-Santiesteban.Fungal Bioremediation: Fundamentals & Applications, CRC Press, Boca Raton, FL.Chapter 5, 2019. 125-172. ISBN 13: 9781138636408

Dr. SNEHASIS CHAKRABORTY

RESEARCH PUBLICATIONS

Title	Author	Journal
Optimizing the extraction of protein from Prosopis cineraria seeds using response surface methodology and characterization of seed protein concentrate.	Garg, D., Chakraborty, S., & Gokhale, J.S. (2020).	LWT - Food Science and Technology, 117, 108630. doi 10.1016/j.lwt.2019.108630
Comparison between multi response-robust process design and numerical optimization: a case study on baking of fermented chickpea flour-based wheat bread	Chakraborty, S. & Shrivastava, C.	Journal of Food Process Engineering, 42(3), e13008. doi 10.1111/jfpe.13008 (2019)
Modeling the inactivation of pectin methylesterase in pineapple puree during combined high-pressure and temperature treatments	Chakraborty, S., Rao, P.S., Mishra, H.N.	Innovative Food Science and Emerging Technologies 52, pp. 271-281(March 2019)
Comparison between multiresponse-robust process design and numerical optimization: A case study on baking of fermented chickpea flour-based wheat bread	Chakraborty, S., Shrivastava, C.	Journal of Food Process Engineering e13008(Feb 2019)

Rheological, functional and morphological characterization of reconstituted Aloe vera gels at different levels of pH and concentration: Novel concepts of reconstituted Aloe vera gels formation	Patruni, K., Chakraborty, S., Pavuluri, S.R.	International Journal of Biological Macromolecules 120, pp. 414-421(Dec 2018)
Investigation of the cell disruption methods for maximizing the extraction of arginase from mutant Bacillus licheniformis (M09) using statistical approach	Momin, B., Chakraborty, S., Annapure, U.	Korean Journal of Chemical Engineering (Oct 2018), Volume 35, Issue 10, pp 2024–2035
Modeling the inactivation of pectin methylesterase in pineapple puree during combined high-pressure and temperature treatments	Chakraborty, S., Rao, P.S., Mishra, H.N.	Innovative Food Science and Emerging Technologies 52, pp. 271-281(March 2019)
Comparison between multiresponse-robust process design and numerical optimization: A case study on baking of fermented chickpea flour-based wheat bread	Chakraborty, S., Shrivastava, C.	Journal of Food Process Engineering e13008(Feb 2019)
Rheological, functional and morphological characterization of reconstituted Aloe vera gels at different levels of pH and concentration: Novel concepts of reconstituted Aloe vera gels formation	Patruni, K., Chakraborty, S., Pavuluri, S.R.	International Journal of Biological Macromolecules 120, pp. 414-421(Dec 2018)
Investigation of the cell disruption methods for maximizing the extraction of arginase from mutant Bacillus licheniformis (M09) using statistical approach	Momin, B., Chakraborty, S., Annapure, U.	Korean Journal of Chemical Engineering (Oct 2018), Volume 35, Issue 10, pp 2024–2035

BOOK CHAPTERS

Title	Authors	Reference
Product Formulation and Shelf Life Evaluation Models.	Shajie, D., Upadhyay, R., Chakraborty, S., & Mishra, H. N. (2018).	Food Products and Process Innovations. New India Publishing Agency, New Delhi, India. Vol II, Chapter 9, pp. 241-258.
High Pressure Processing of Fruit Juice and Puree.	Chakraborty, S., Kaushik, N., & Mishra, H. N. (2018)	Food Products and Process Innovations. New India Publishing Agency, New Delhi, India. Vol I, Chapter 11, pp. 305-344

IN-HOUSE COMMITTEES & RESPONSIBILITIES

FACULTY

Sr.	Faculty Name	Department Level Responsibility	Institute Level Responsibility
1.	Professor Smita S. Lele	Summer Training and Campus (IPT and Placement cell)	Registrar (upto August 2018) Member, Legal Cell, Appellate Comitee and other Exam related Committees and several others as Registrar.
2.	Professor Rekha S. Singhal	Departmental TEQIP coordinator	Member, Students' Welfare TEQIP coordinator, Faculty Activities
3.	Dr .Uday S. Annapure	Head, FETD	Co-Chair, UG Admission Committee
4.	Dr. Laxmi Ananthanarayan	Co-ordinator, Food Biotechnology course	-

5.	Dr Shalini S. Arya	Co-ordinator : Departmental Activities	Nodal Officer, District Social Welfare Office Member, Equal Opportunity Cell (EOC) Member, Unfair Means in Examinations and Vigilance squad committee Member, Member, Cultural Activity Committee, Member, Hostel committee Member, Anti-Ragging Committee
6.	Dr.Jyoti S. Gokhale	-	Warden Hostel No. 3 Member, Timetable Committee
7.	Dr. Snehasis Chakraborty	-	Canteen & catering

SEMINARS/LECTURES/CONFERENCES/WORKSHOP/SUMMER OR WINTER TRAINING SCHOOLS ATTENDED/ORAL OR POSTER PRESENTATIONS

Poster presentation

1. Effect of different wall materials on encapsulation of Kokum (Garcinia indica) extract using spray drying and freeze drying. Sachin R. Adsare, Saurabh S. Joshi Uday S. Annapure, during conferenceiCRAFPT-2018, held at IIFPT, Thanjavur. August 17-19th,2018.
2. Studies on water soluble polysaccharide from Buchananialanzan(charoli) plant exudate. Bhushan B. Chaudhari and Uday S. Annapure, during conference iCRAFPT-2018, held at IIFPT, Thanjavur. August 17-19th, 2018.
3. Development of a solkadhi dry mix using dehydrated kokum juice powder and coconut milk powder, Sachin R. Adsare and Uday S. Annapure, during IFCoN 2018 held at CSIR-CFTRI, Mysore, December 12-15th, 2018
4. Studies on water soluble polysaccharide from Limonia acidissima L(Kavat) plant exudate, Bhushan Chaudhari and U.S.Annapure. during IFCoN-2018 held at CSIR-CFTRI, Mysore, December 12-15th, 2018
5. Isolation, purification and physiochemical property of Sterculia foetida exudate gum, Bhushette P.R. and Annapure, U.S. during IFCoN-2018 held at CSIR-CFTRI, Mysore, December 12-15th, 2018
6. Characterization of Tree Exudate of Moringa oleifera, S.K. Jondhale, O.S.Sawant, P.R. Bhushette and U.S. Annapure, during IFCoN-2018 held at CSIR-CFTRI, Mysore. December 12-15th, 2018
7. Effect of cold plasma treatment on the functional properties of Acacia gum, K Bangale, A Mishra, P.R. Bhushette, R.R. Deshmukh, and U.S. Annapure, during IFCoN 2018 held at CSIR-CFTRI, Mysore. December 12-15th, 2018
8. Strategic selection criteria of growth phase of newly isolated heterotrophic microalgae Thraustochytrid sp. from mangroves region of Navi Mumbai, India as feedstock for biofuel and omega 3 fatty acid. Vaishali P. Bagul, Uday S Annapure, during International conference on Biotechnological Research and Innovation for Sustainable Development & XV BRSI Convention held at CSIR-IICT, Hydrabad. 22-25th November 2018.
9. Microencapsulation of Kokum (Garcinia indica) Fruit Aqueous Extract by Spray and Freeze Drying. Sachin R. Adsare, Uday S Annapureduring One-Day In house seminar on "Uprising Drift in the path of Food Biotechnology & Fermentation Technology" at ICT Mumbai. 26th December 2018.
10. Valorization of mutant Bacillus licheniformis M09 supernatant for green synthesis of silver nanoparticle: Photocatalytic dye degradation, antibacterial activity and cytotoxicity. Momin Bilal, Uday S Annapure during One-Day In house seminar on "Uprising Drift in the path of Food Biotechnology & Fermentation Technology" at ICT Mumbai. 26th December 2018.

Oral presentation

11. Effect of Cold Plasma On Cooking Quality of Wheat Grits. Anusha Mishra and Uday S. Annapure, at iCRAFPT- 2018, held at Indian Institute of Food Processing Technology, Thanjavur.. August 17-19th,2018
12. Effect of culture condition on biomass, lipid content and fatty acid composition from native strain thraustochytrid ICTFD-5 for Biodiesel and omega 3 fatty acid production. Vaishali P. Bagul and Uday S. Annapure duringOne-Day In house seminar on "Uprising Drift in the path of Food Biotechnology & Fermentation Technology" at ICT Mumbai. 26th December 2018.
13. Enhancement of Thermal Protection of Probiotic Coated Corn Flakes using Acacia Gum. Bhupender D. Singu and Uday S Annapure duringOne-Day In house seminar on "Uprising Drift in the path of Food Biotechnology & Fermentation Technology" at ICT Mumbai. 26th December 2018.
14. Immobilization of acrylamidase from novel isolate, Cupriavidus oxalaticus ICTDB921 for mitigation of acrylamide from roasted coffee, Dattatray K. Bedade, Novel competition for 3 minute presentation on Ph. D. topic, organized by UDCT alumni association (UAA) on the occasion of foundation day, May 11, 2018 (Won the first prize of Rs. 10,000/- for this competition).
15. Biodegradation of acrylamide by a novel isolates, Arthrobacter sp. DBV1 and Cupriavidus oxalaticus ICTDB921: Identification and characterization of the acrylamidase produced, Dattatray K. Bedade, oral presentation at Dr. Dhala's Felicitation fund research paper presentation, organized by Bhavan's College, Andheri (W), Mumbai, September 8, 2018.

SUMMER SCHOOL

16. Sachin Ramdas Adsare, Participated in "Food Safety and Security Institute Program-2019" at Manna Center for Food Safety and Security, Tel Aviv University, Tel Aviv, Israel from 25th June to 28th July, 2019.

SEMINARS/CONFERENCES ATTENDED

PROF. S. S. LELE

- Attended a 19th World Congress of Food Science and Technology conference, IUFoST- 2018 at CIDCO convention & Exibition Centre, New Mumbai on 23-27, October 2018

PROF. R.S. SINGHAL

- Attended a 19th World Congress of Food Science and Technology conference, IUFoST- 2018 at CIDCO convention & Exibition Centre, New Mumbai on 23-27, October 2018
- Agriculture and the Imperatives of Food & Nutrition Security, a workshop organized by CTARA, IIT Bombay, December 6-7, 2018 and participated in the panel discussion.

PROF. U. S. ANNAPURE

- Attended a 19th World Congress of Food Science and Technology conference, IUFoST- 2018 at CIDCO convention & Exibition Centre, New Mumbai on 23-27, October 2018
- International Conference on Recent Advances in Food Processing organized by Indian Institute of Food Processing Technology, Thanjaur during August 17-19, 2018
- International Conference on "Technological Innovations for Integration of Food and Health (TIIFH 2019): A focus on North-East India" at the Tezpur University (A Central University), Assam, India between February 14 and 16, 2019;
- National Seminar on "Entrepreneurship Development in Soy Food Processing" organised by US Soybean Export Council, USSEC in collaboration with the Association of Food Scientists and Technologist, on June 29, 2018 at Hotel Peninsula Grand, Saki Naka, Andheri (E), Mumbai.
- Attended Workshop on Food Preservation Techniques organized by BIRAC in collaboration with Institute of Chemical Technology at ICT, Mumbai during February 26–28, 2018

DR. L.ANATHNARAYAN

- Attended a 19th World Congress of Food Science and Technology conference, IUFoST- 2018 CIDCO convention & Exibition Centre, New Mumbai on 23-27, October 2018

DR.J.S.GOKHALE

- Attended a 19th World Congress of Food Science and Technology conference, IUFoST- 2018 at CIDCO convention & Exibition Centre, New Mumbai on 23-27, October 2018

DR. SNEHASIS CHAKRABORTY

- Attended a 19th World Congress of Food Science and Technology conference, IUFoST- 2018 at CIDCO convention & Exibition Centre, New Mumbai on 23-27, October 2018

SPECIAL LECTURES / VISITS

PROFESSOR REKHA S. SINGHAL

SPECIAL LECTURES

1. Procedures and data requirements for approval of food additives in India, a lecture delivered at FDA Bhawan, New Delhi at a seminar on 'Food Additives: A Global Perspective on Safety Evaluation and Use', organized by USDA/ FSSAI and ILSI-India, June 19-20, 2018.
2. Food fortification- the technological considerations, a lecture delivered at a seminar on 'Transition from Food Security to Nutrition Security', organized by Nutrition Society of India and Smt Maniben M. P. Shah Women's College, Mumbai, September 8, 2018.
3. Food safety from farm-to-fork- an overview, a lecture delivered at TEQIP sponsored two day National Workshop on Food Safety: Current Scenario and Future Challenges, organized by Islamic University of Science and Technology, Awantipora, Pulwama, J & K, September 18, 2018.
4. Traceability to control and monitor safety and quality throughout the food chain, a lecture delivered at Session 62 on 'Effective Methods to Provide Quality and Safe Food Chain' and also chaired this session at IuFOST 2018, held at CIDCO Convention and Exhibition Centre, Navi Mumbai, India, October 23-27, 2018:
5. Ecotoxicity of metal nanoparticles in a model aquatic organism: enzymatic biomarkers and bioaccumulation perspective, a lecture given at 'Bio-Innovation for Environmental and Health Sustainable Developments', organized at Indian Institute of Toxicology Research, Lucknow in association with Biotech Research Society of India, November 28, 2018, and also chaired a session at the same.
6. Influence of climate change on food safety, a lecture delivered at International Conference on Food Security: Challenges and Opportunities, organized at Thapar Institute of Engineering and Technology, Patiala, December 7-8, 2018, and also chaired a session at the same.
7. Bioavailability of nutraceuticals: Some insights, Golden Jubilee lecture delivered at Indian Institute of Food Processing Technology, Thanjavur, January 30, 2019.
8. Tips for writing research papers, a lecture delivered on the occasion of National Science Day at College of Home Science, Nirmala Niketan, Churchgate, organized by Nutrition Society of India (Mumbai Chapter), Fenruary 28, 2019.

DR. UDAY S. ANNAPURE

1. "Cold Plasma Processing for Food and Agriculture" an invited talk at International Conference on Recent Advances in Food Processing organized by Indian Institute of Food Processing Technology, Thanjaur during August 17-19, 2018
2. "Cold Plasma: An Emerging Non-thermal Technology for Food and Agriculture" an invited talk at International Conference on "Technological Innovations for Integration of Food and Health (TIIFH 2019): A focus on North-East India" at the Tezpur University (A Central University), Assam, India between February 14 and 16, 2019;
3. "Soy Based Extruded Products" an invited talk delivered at seminar on "Entrepreneurship Development in Soy Food Processing" organised by US Soybean Export Council, USSEC in collaboration with the Association of Food Scientists and Technologist, on June 29, 2018 at Hotel Peninsula Grand, Saki Naka, Andheri (E), Mumbai.
4. "Principles of Food Preservation" an invited talk delivered at WORKSHOP ON FOOD PRESERVATION TECHNIQUES organized by BIRAC in collaboration with Institute of Chemical Technology at ICT, Mumbai during February 26–28, 2018

Dr. S.S Arya

1. Given a talk on prospectus of food technology at Bhaskarcharya College of applied sciences at New Delhi on 26 October, 2018.

ORAL/POSTER PRESENTATIONS

PROFESSOR REKHA S. SINGHAL

POSTER PRESENTATIONS:

1. Iron-amino acid chelates: synthesis, characterisation and bioavailability in Sprague Dawley rats, Madhura Janve, P Jain and Rekha S. Singhal, poster presented at Bioavailability 2018- Understanding the bioavailability of micronutrients and bioactive compounds for improved public health, John Innes Conference Centre, Norwich Research Park, UK, NR4 7UH, organized by Elsevier, Quadram Institute, ETH Zurich, and University of East Anglia, September 10-13, 2018.
2. Following posters were presented at IuFOST 2018, held at CIDCO Convention and Exhibition Centre, Navi Mumbai, India, October 23-27, 2018:

a) Structural modification of catechin for enhanced functionality, Sandesh Marathe, Apoorva Gupta and Rekha S. Singhal (Won the best poster award).

b) Euryale forexis seeds: Carbohydrate profiling, functional properties and extrusion to noodles for application in ready-to-cook kheer, Seema Bajaj, Swapnil mali and Rekha S. Singhal

c) Computational and experimental studies on the absorption of iron supplements through human divalent metal transporter, Madhura Janve, Aarti Anantram, Mariam Degani and Rekha S. Singhal

3. Stabilization of cutinase and improvement of its catalytic activity by ultrasonication and covalent attachment on functionalized magnetic nanoparticles, Abhijeet Muley, Sandeep Chaudhari, Sandip Bankar and Rekha S. Singhal, a poster presented at Internatiobnal Conference on Biotechnological Research and Innovation for Sustainable Development (BioSD-2018), organized by Biotech Research Society of India and Indian Institute of Chemical Technology, Hyderabad, November 22-25, 2018 [was selected for Young Researcher's Power Presentation].
4. Following posters were presented at IFCON 2018, held at CFTRI, Mysore, December 12-15, 2018:

a) Extrusion processing for pre-sweetened noodle grits for the preparation of instant kheer: stability of added artificial sweeteners, Amruta M. Bawane, Rekha S. Singhal

b) Formulation and evaluation of debittered bitter gourd (Momordica charantia) juice with enhanced anti-diabetic potential, Shweta Deshaware, Sumit Gupta, Rekha S. Singhal and Prasad Variyar

5. Development and evaluation of oleogel as a shortening agent for bakery products, Ashwani Kumar, Rekha S. Singhal and Alak Kumar Singh, poster presented at International Conference on Technological Innovations for Integration of Food and Health (TiiFH 2019): A Focus on North-Eastern India, organized by Department of Food Engineering and Technology, Tezpur University, Assam, February 14-16, 2019.

ORAL PRESENTATIONS:

1. Effect of extrusion processing and hydrocolllids on the stability of added vitamin B12 and physic-functional properties of the fortified puffed extrudates, an oral presentation at International Conference on Technological Innovations for Integration of Food and Health (TiiFH 2019): A Focus on North-Eastern India, organized by Department of Food Engineering and Technology, Tezpur University, Assam, February 14-16, 2019.

PROF. UDAY S. ANNAPURE

- Oral Presentation presented onEffect Of Cold Plasma On Cooking Quality of Wheat Grits,Anusha Mishra and U. S. Annapure, at iCRAFPT- 2018, held at Indian Institute of Food Processing Technology, Thanjavur,on August 17-19th, 2018
- Following posters were presented at iCRAFPT-2018, held at IIFPT, Thanjavur, on August 17-19th, 2018.

1) Effect of different wall materials on encapsulation of Kokum (Garcinia indica) extract using spray drying and freeze drying, Sachin R. Adsare, Saurabh S. Joshi and U.S.Annapure.

2) Studies on water soluble polysaccharide from Buchananialanzan(charoli) plant exudate. Bhushan B. Chaudhari and Uday S. Annapure.

- Following posters were presented at 8th International Food Convention (IFCON 2018) Holistic approaches for start up , Human resource training for agriculture and food industry gemmation (HASTAG) organised by AFST(I) during December 12-15, 2018, CSIR-CFTRI, Mysore, India.

1) Isolation, Purification and Physiochemical properties of sterculia foetida exudate gum, Bhushette P.R. and U.S.Annapure.
2) Studies on water soluble polysaccharide from Limonia acidissima L(Kavat) plant exudate, Bhushan Chaudhari and U.S.Annapure.
3) Development of a solkadhi dry mix using dehydrated kokum juice powder and coconut milk powder, Sachin Adsare and U.S. Annapure
4) Characterization of tree exudate of moringa oleifera, s.k. jondhale, O. S. Sawant, Bhushette P.R. and U.S.Annapure.
5) Effect of cold plasma treatment on the functional properties of acacia gum, K.Bangale, A.Mishra,P.R. Bhushette, R. R. Deshmukh, and U.S. Annapure

- Presented a poster on Strategic selection criteria of growth phase of newly isolated heterotrophic microalgae Thraustochytrid sp. from mangroves region of Navi Mumbai, India as feedstock for biofuel and omega 3 fatty acid. Vaishali P. Bagul, U.S. Annapure, during International conference on Biotechnological Research and Innovation for Sustainable Development & XV BRSI Convention held at CSIR-IICT, Hydrabad. 22-25th November 2018.
- Presented posters during one-day in house seminar on "uprising drift in the path of food biotechnology & fermentation technology" at ict Mumbai, on 26th , December 2018.

1) Microencapsulation of kokum (garcinia indica) fruit aqueous extract by spray and freeze drying, Sachin R. Adsare and U.S. Annapure.
2) Valorization of mutant bacillus licheniformis m09 supernatant for green synthesis of silver nanoparticle: photocatalytic dye degradation, antibacterial activity and cytotoxicity, Momin Bilal and U.S. Annapure.

- Oral Presentation Presented during one-day in house seminar on "uprising drift in the path of food biotechnology & fermentation technology" at ICT Mumbai, on 26th , December 2018.

1) Effect of culture condition on biomass, lipid content and fatty acid composition from native strain thraustochytrid ICTFD-5 for biodiesel and omega 3 fatty acid production,Vaishali P. Bagul and uday s annapure
2) Enhancement of thermal protection of probiotic coated corn flakes using acacia gum,Bhupender D. Singu and U.S. Annapure

SEMINARS / WORKSHOPS ORGANIZED

- Department of Food Engineering and Technology organized One-day in-house seminar on “Uprising Drift in the Path of Food Biotechnology and Fermentation Technology” on 26th December 2018 at ICT Mumbai. This seminar is organized under UGC-CAS-II activity.The seminar is totally dedicated to research students of FETD
- Department of Food Engineering and Technology organized three days Hands on training seminar on Food biactives on 5-7th February 2019 at FETD, ICT Mumbai. This seminar is organized under Tequip-III .
- Department of Food Engineering and Technology organized one day In House Food Product Development Competition on 2nd February 2019 at FETD, ICT Mumbai.
- Department of Food Engineering and Technology organized a half day seminar on ‘carbohydrates in food and food processing’ under aegis of UGC CAS-II and Tequip –III on 6th March, 2019 at ICT, Mumbai.

ENDOWMENT AND OTHER LECTURES ORGANIZED IN THE DEPARTMENT

Sr. No.	Date	Fellowship	Distinguished Speaker / Affiliation	Title of Lecture
1.	July 4, 2018	Guest lecture	Prof. Said Ajlouni Faculty of Vaternary and agricultural science, University of Melbourne	Probiotics and functional foods
2.	July 26, 2018	Visiting lecture	Dr. Anil de Sequeira, FIFST, CSci, FHEA; External Affairs Co-ordinator (Biology), Field of Culture and Environment, College of Liberal Arts, Bath Spa University (BSU), UK	Smart Packaging
3.	January 2, 2019	Golden Jubilee Endowment lecture	Dr. Rose P. Webster	Growing role of information technology in biology & medicine
4.	February 7, 2019	Lupin visiting fellowships for bioprocess technology	Dr.U.C. Banerjee Department of Pharmaceutical Technology, National Institute of pharmaceutical education & research, Punjab, India	Process development for the production of various microbial metabolites and use of enzymes and whole cells for the synthesis of chiral drugs and drug intermediates
5.	February 20, 2019	Guest lecture	Dr. Prabodh Trivedi Sr. Principal Scientis, CSIR, Lucknow	Regulatory network and pathway engineering of the flavonoid biosynthesis
6.	February 20, 2019	Guest lecture	Dr. Prathapkumar Shetty, FRSc, Pondicherry	Traditional fermented food microbial diversity health and industrial perspectives
7.	March 16, 2019	Guest lecture	Dr. Shivendu Ranjan DST-Centre for Policy Research, Lucknow, Uttar Pradesh	Electrospinning and Electrospraying in Food and Nutraceutical

DETAILS OF MASTERS/Ph.D. STUDENTS SUPERVISED

Ph.D. (TECH) (FOOD ENGINEERING AND TECHNOLOGY/BIOPROCESS TECHNOLOGY/FOOD BIOTECHNOLOGY)

Ph.D. (TECH) (FOOD ENGINEERING AND TECHNOLOGY)

Research Scholar: Shah Nirali Nitin
Research Supervisor: Prof.R.S. Singhal
Biopolymer modifications for novel food applications

Biopolymers are ubiquitous in nature, and find numerous applications in a wide range of industries. Many of these biopolymers are amenable to physical or chemical modification to tailor physicochemical, mechanical and functional properties for desired applications. Hydrophobic modification of biopolymers by covalent incorporation of alkyl/alkenyl carbon chain in the structure has been an area of extensive research. Carboxylic acids, their derivatives and alkyl halides are used for this purpose. The abundant presence of certain chemical groups, for instance, hydroxyl groups in polysaccharides and amino groups in the primary structure of proteins, enable reactions with the above mentioned reagents. The introduction of apolar chains and charged groups in uncharged or already charged biopolymers lead to changes in structure and hence functional properties of the biopolymers. The present work was undertaken to study some of these aspects, with biopolymers being restricted to polysaccharides and proteins.

1. Hydrophobic modification of polysaccharides: polysaccharides were hydrophobically modified, evaluated for changes in properties and applications were developed therefore as follows:i) n-Octenyl succinylated pullulan was synthesized and then used as edible coating of sapota fruit for extending its shelf life under ambient storage by studying biochemical and physical parameters. The developed polymer was campared to pullulan coating made with emulsified oil. Ii) Synthesis, characterization and application of n-Octenyl succinylated guar gum (GGOSA) as a dual-functional additive in bread and mashed potatoes was performed. GG-OSA with degree of substitution of 0.025 proved to be a potential replacer for diacetyl tartaric and fatty acid esters of glycerol as an antistaling agent in bread, iii) Dual modification of maize starch by oxidation followed by esterification, structural characterization followed by studies on emulsification and microencapsulation of soybean oil was investigated. The starchwas esterified by either using n-OSA or dodecenyl succinic anhydride (DDSA). Oxidation and n-Octenyl succinylation of maize starch under the limits approved by JECF A for food use proved to be a potential replacer for gum Arabic for emulsification and microencapsulation of soybean oil. These results were obtained from the entrapment and encapsulation efficiencies, surface morphology and 18 weeks of study of oil retention in the microcapsules. Food Engineering and Technology I Institute of Chemical Technology I 47
2. Modification of Pea Protein Isolate: Succinic anhydride, n-OSA and DDSA derivatives of pea protein isolates (PPI) were synthesized, structurally characterized and evaluated for changes in fuctional properties. These modification improved the fuctionally of the proteins at certain pH. These derivatives were investigated as emulsifiers in eggless cake by evaluation of physical properties of freshly baked cakes. The hypothesis behind this study was to compare the effect of modified proteins versus a blend of emulsifiers on the quality of fresh eggless cake. PPI modified with succinic anhydride (PPISA) with 48.39% of lysine modification was the best among the derivatives as an emulsifier for eggless cake. The texture, cake rise and air cells of cakes containing PPSA were comparable to cakes containing soy protein and whey protein isolates.
3. Protein – polysaccharide interactions: the interactions between native and modified (succinylated, n-octenyl succinylated and dodecenyl succinylated) pea protein isolates and polysaccharides (guar gum and CMC) at two protein: polysaccharide rations (5:10 and 10:1) were evaluated on the functional properties such as solubility, emulion stability, foaming capacity and stability at different pH (3, 5, 7, and 9). Oil holding and water holding capacities of the blends were also evaluated. The increased negative charge in the modified proteins led to changes in interaction with the polysaccharides and hence influenced the functional properties. The higher proportion (5:1) of polysaccharide in the blend had profound effects on functional properties compared to the lower proportion (10:1).
4. Gelling profiles of OSA s t a r c h - h y d r o c o l l o i d blends: the effect of gelling hydrocolloids on the gelling profile of n-octenyl succinylated maize starch was evaluated. Native or modified maize starch was blended with hydrocolloids such as gellan gum, xantham gum, high methoxy pectin and low methoxy pectin to form gels pH(3,5,7 using citric acid) and in the presence of sugar (20%, w/w). These gels were analysed for their texture profile in terms of hardness, cohesiveness and springiness. The negative charge in modified starch structure due to the half-ester led to charges in interaction with the gelling hydrocolloids which also possess negative charge. There were synergistic as well antagonistic effects in the texture of the gels.

Research Scholar: Sonal Patil
Research Supervisor: Dr. S.S. Arya
Studies on production and characterization of gluten-free flat bread

The current health issue for many people involves the consumption of gluten i.e. celiac disease which manifests with permanent gluten intolerance. Flatbread (chapatti) is a stable food of india made from whole wheat. Gluten is a major and unique protein giving the important structural properties and quality to the chapatti. Development of flatbread in the absence of this wheat gluten is a technical challenge. Hence, present study was aimed at the development and characterization of gluten free flatbread (GFFB).

1. Screening of ingredients used for development of GFFB: the main challenge in the preparation of GFFB is to achieve the requisite elasticity which differs significantly from other bakery products. Hence, flours from various sources were screened viz; rice, sorghum, moong, amaranth, sama, ragi, water chestnut (WCF), buckwheat, soy, tamarind kernel, chickpea, blackgram and unripe banana (UBF) flours during the optimization and preparation of GFFB. The screening criterions used were: dough making ability, rollability, puffing and sensory overall acceptability. Based on these criterions rice and sorghum, unripe banana, water chestnut and moong flours were used to substitute wheat in preparation GFFB as they possess higher levels of similarities with wheat flour as shown by PCA and HCA clusters.
2. Characterization of gluten free flours to be used for the development of GFFB: while the preparation of any food, knowledge of physicochemical, functional and rheological characteristics of ingredients are important to predict the final product with desirable qualities and simplify processing. Glutenfree flours except sorghum have lower density, carr's index and hausner's ration compared to wheat. Gluten free flours were characterized by high cohesiveness and poor flowability. The study of bioactive constituents showed their higher concentration in UBF and WCF compared to wheat. XRD study revealed their varying crystallinity patterns and d spacing values as compared to wheat. All the samples except UBF exhibited good pasting properties making them suitable for different food formulations. Gluten free samples were inferior in viscoelastic properties than wheat flour but MF. All the flours were found to have thixotropic behavior.
3. Development and characterization of GFFB: mixture design tool (D-optimal design) was employed in the development of GFFB. Above selected flours were used for the purpose and response variables were dough stickness and dough strength along with flatbread characteristics like tear force and sensory overall acceptability. GFFB prepared from a mixture of rice (60%), sorghum (10%), WCF(15%), UBF(5%) and moong flour (10%) showed Food Engineering and Technology I Institute of Chemical Technology I 283 better dough stickiness (32.36g) and strength (1.56g), tear force (420.33g) and sensory acceptability (7.3) thus showed great potential for commercial application. Gluten free flour mixture thus developed had similar structural rigidity and similar viscous behavior along with shear dependency as that of whole wheat flour.
4. Improvement in quality of GFFB and development of additive premix: simplex centroid design with 15 model points was used for the study. Preselected additives (guar gum, xanthan gum, sodium stearoyl-2- lactylate(SSL)and glycerol monostearate (GMC)) were the independent variables and responses analysed were dough characteristics (stickiness, strength, hardness, elasticity, gumminess) and flatbread characteristics (tear force, hardness,elasticity, chewiness, resilience). It was found that guar gum (0.8%), xanthan gum(0.3%) and GMS (0.9%) hence called as additive premix when added imparted gluten free dough and GFFB Best rheological and textural properties).
5. Study of effect of ingredients and modified flours on the characteristics of GFFB: preliminary studies were carried out by incorporation one ingredient (additive premix, proteins) and modified flours (extruded and germinated flours) at a time. It was found that extruded flours made from low density and high expanded extrudete improved the GFFB properties. Hence, part of the study was carried out for the development of gluten free extruded snack which was further ground to flour and was used in GFFB preparation and analysed.

5a. Development of gluten free extruded snack: distance based design of response surface methodology was employed which involved use of two variables at five different stages with six central points. Feed moisture and die temperature were independent variables. Low density (a desirable characteristic of expanded product) was achieved at medium levels of feed moisture (16%) and moderate die temperature (1600C).

5b. Study of effect of ingredients and modified flours on the characteristics of GFFB: central composite design of response surface methodology was employed. Independent components of the mixture included additive premix extruded flour, germinated flour and whey protein. Dough stickiness increased with increase in additive premix proportion as well as with increase in whey protein. Germinated flour and whey proteins led to an increase in the dough strength of gluten free formulation. A significant decrease in tear force of GFFB was observed when additive premix was added in increasing proportion. Extensibility increased tremendoudsly with the increased proportion of additive premix and whey protein.additive premix (1.5%), extruded flour (10%), germinated flour (20%) and whey proteins (6%) were helpful to produce dough with improves values for stickiness (39.09g) and strength (2.14g) softer (tear force, 224.67g) and bright colored (L value, 40.90) GFFBs.

6. Inhibition of staling in GFFB: staling is the major problem associated with GFFB. Three hurdles were employed for the inhibition of staing viz. addition of additive premix, application of edible coating and low temperature storage. In the present study, it was seen that surface coating when done during baking yield better quality GFFB compared to the surface coating treatment performed post baking (sensory acceptability 6.97 and 6.8 respectively). groundnut oil

coating was used based on quality retention properties (sensory acceptability 6.72) and fuzzy logic calculations of sensory data. During staling quality of GFFB deteriorates very fast as compared to whole wheat flour flatbread. Staling rate was successfully retarded with the help of addition of additive premix, oil coating on the surface of the 284 I Institute of Chemical Technology I Annual Report 2016-17 GFFB during baking and refrigeration temperature storage. It can be stated as GFFBs prepared with added additive premix followed by groundnut oil coating was fresh flatbread alike characteristics when stored at refrigeration temperature at the end of 192 hrs. (moisture content 36.65%, tear force 263.83g, water soluble starch 11.06%, phenolic compounds 8.50mg/g GAE, antioxidant activity 1.72%).

Research Scholar: Sonali Gaikwad
Research Supervisor: Dr. S.S. Arya

Chemistry and technology of cereal legume based Indian traditional food

Thalipeeth is an Indian unleaved flatbread made from multigrain bhajani flour with added spices and seasonings. Bhajani is medley of cereals and legumes. Thalipeeth preparation requires a lot of time, skills and its quality deteriorate due to staling and microbial spoiling during storage. Hence, present study was aimed at the optimization. Characterization, improvement in quality and inhibition of staling of Indian savoury flatbread (Thalipeeth).

1. Formulation and p h y s i c o c h e m i c a l characterization of bhajani: The main challenge in the preparation of bhajani flour is to achive proper combination of cereals and legumes to provide good process ability and overall acceptability to final product i.e. thalipeeth. For the optimization of bhajani, criteria used were: dough properties and sensory evaluation. Farinograph studies showed 402 BU consistency indicating it is low gluten flour. Rheology studies on bhajani flour showed thixotropic behavior. XRD studies revealed that bhajani flour contained C-type of starches. Granular structure of starch was observed from SEM. Optimized bhajani formulation was suitable for good dough making. Rollability and overall acceptability parameters.
2. Standerisation of ingredients and process parameters for thalipeeth: Thalipeeth with 48 I Institute of Chemical Technology I Annual Report 2017-18 highest overall acceptability was successfully optimized by using ingredients; salt 4%, red chilli 4%, cumin seed powder 1%, turmeric 0.6%, onian 40%, ginger: garlic 1:2, coriander 6% and 35g dough ball rolled into 14cm thalipeeth sheet along with baking temperature of 1400 C for 1 min. optimized thalipeeth was high in protein with low in GI values (44) and high protein digestibility 64 (g/100g), SEM of thalipeeth revealed distorted and squeezed starch granules on the inner side of the thalipeeth crumb. Standerized thalipeeth showed better dough stickiness (30.20gm), dough strength (1.10mm/sec) and tear force (418g).
3. Effect of additives on quality improvement and evaluation of dough and thalipeeth: in the present study, effect of additives like hydrocolloids(guar gum, xantham gum), p o l y s a c c h a r i d e s (h y d r o x y p r o p y l methylcellulose(HPMC)), emulsifiers (stearoyl)-2 lactylate (SSL), glycerol mono stearate (GMS) and psyllium husk ranging between 0.25 to 1% on the quality of multigrain flour, dough and thalipeeth was evaluated. All the additives contributed significantly in the improvement of overall quality of dough and thalipeeth such as high extensibility (4.45mm), a significant increment in dough stickiness (36.87gm) and cohesiveness (1.45mm/ sec) as compared to other additives. The force required to tear thalipeeth was remarkably decreased with the addition of guar gum. The microstructure of thalipeeth with guar gum showed proper gelatinization of starch due to good moisture retention properties of dough which resulted in uniform texture of final product. Guar gum at the concentration of 0.75% w/w of multigrain flour gave the softest and attractive surface with highest overall acceptability. It remarkably improved rheological properties of dough and subsequently texture of flat bread product.
4. Inhibition of staling : Staling is the major problem associated with thalipeeth. For the inhibition of staling various approaches were employed viz., lowtemperature storage. Frozen storage, par-baking. Staling of thalipeeth occurred both at room tempature and refrigeration temperature storage, however, the rate of staling was less at refrigeration temperature (4+o C) than that at room temperature (29+1oC) storage. Frozen storage at -18oC of thalipeeth dough, ready to eat thalipeeth and partially baked thalipeeth significantly preserved the freshness by restricting staling process. Addition of additives (guar gum and GMS) significantly preserved quality of frozen dough, par-bake as well as ready to eat thalipeeth. Amongst all the samples, ready to eat thalipeeth was most effectively preserved for the textural and sensory properties even after 45days of frozen storage.
5. Nutritional characterization of thalipeeth: effect of addition of ragi, pearl millet and barley flours at levels of 10, 20 and 30% in the optimized bhajani flour dough and thalipeeth was evaluated. The optimization of level was carried out on the basis of dough rhelogy, textural and sensory properties of thalipeeth. Thalipeeth containing 10% barely flour received highest sensory overall acceptability score. Physical characterization of barley thalipeeth for quality parameters such as dough stickiness. Color and tensile properties (tear force and extensibility) was carried out. Further nutritional characterization for proximate, bioactive constitutes (total phenolic content, flavonoids, tannins and antioxidant activity), in-vitro glycemic index and in-vitro protein digestibility was carried out. Significant improvement in bioactive constituents such total phenolic content, flavonoids, tannins and antioxidant activity of thalipeeth containing 10% barley flour was observed.

Ph.D. (TECH) (FOOD BIOTECHNOLOGY)

Research Scholar: Bincy Bhaskar
Research supervisor: Dr. Laxmi Ananthanarayan

Studies on angiotensin I-converting enzyme (ACE) inhibitory and antioxidant peptides from selected legumes commonly consumed in India

In recent years, it has been identified that dietary proteins can provide a rich source of biologically active peptides. Bioactive peptides remain inactive within the parent protein molecule and generally contain about 3-20 amino acid residues.Legumes are major protein sources in developing countriesand are increasingly used as a substitute for animal proteins in developed countries. Thus, these legumes can be evaluated for their potential to generate ACE(Angiotensin Converting Enzyme) inhibitory and antioxidant peptides.

1. In silicostudies: Theglobulin protein sequences of some legumeswere retrieved from UniProt.These sequences were then processed for ACE inhibitory and antioxidant peptides using BIOPEP database. Analysis showed legumin protein from kidney bean and chickpeato be a potential source of ACE inhibitory and antioxidant peptides. Enzymes like proteinase k, pepsin, papain, ficain, chymotrypsin C and thermolysin showed maximum capability in generation of ACE inhibitory and antioxidant peptides from the selected proteins. The highest number of ACE inhibitory and antioxidant peptides after three enzyme proteolysis (in silico) was found to be generated by conarachin of peanutand legumin of pigeon pea, respectively. This work can help in screening legume protein sequences to identify the potential precursors of bioactive peptides as well as in proteolysis simulation.
2. CE inhibitory and antioxidant potential in seeds vs sprouts: Five legumes (hyacinth bean, moth bean, kidney bean, white pea and lentil) were taken for study. Effect of soaking, germination for 24 h, 48 h and 72 h as well as cooking after soaking on the free amino nitrogen content, ACE inhibitory and antioxidant activity of these legumes was investigated. Different treatments to legumes did not contribute significantly to ACE inhibitory activity though antioxidant activity of legumes was improved by it.
3. Studies on generation of ACE inhibitory and antioxidant peptides after In Vitro Protein Digestion (IVPD): In vitro protein digestion (IVPD) with pepsin, trypsin and chymotrypsin was carried out on the same five legumes with the same treatments. Free amino nitrogen content and solubility increased on IVPD. Also, ACE inhibitory activity and antioxidant potential increased in all treatments considered under study when compared to their non IVPD counterpart.
4. Effect of fermentation on production of ACE inhibitory and antioxidant peptides: Idli is a cereal-legume based fermented food popular in India. Rice and black gram (3:1) was used for preparation ofidlibatter and alcalase enzyme was added to the batter in different concentration for 14 h. Changes in pH, titratable acidity, batter volume, viscosity, free amino nitrogen content, microbial count, ACE inhibition and antioxidant activity of the idli batter after treatment with alcalase were studied. Sensory analysis of the cooked idli was performed. Addition of alcalase inidlibatter improved the ACE inhibitory and antioxidant activity and free amino nitrogen in the idli batter which could be due to hydrolysis of proteins into peptides. However, it affected the texture as well as bulk density to a certain extent when compared to control idli.
5. Effect of enzyme hydrolysis on the functional properties of horse gram: Alcalase enzyme was chosen for hydrolysis of whole horse gram to study the changes in functional properties after hydrolysate production. HG flour was mixed with water in the ratio of 1/10 (w/v) and alcalase added at E/S ratio of 1:10 (v/w) at pH 8.0 for different time periods. Degree of hydrolysis (DH) calculated by TNBS method showed that hydrolysis progressed rapidly with a decline in

the rate subsequently by five hours. Different hydrolysates with different degree of hydrolysis were produced which were then checked for ACE inhibition, antioxidant activity, protein solubility, emulsifying and foaming properties. It was observed that all the properties except foaming improved with 50 I Institute of Chemical Technology I Annual Report 2017-18 increase in hydrolysis of whole horse gram flour by alcalase, particularly of HGH with DH 40%.

6. Purification and characterization of ACE inhibitory peptides: Horse gram hydrolysate showing highest ACE inhibitory activity (DH40) was chosen for further purification and characterization. It was purified by ultrafiltration, ion exchange chromatography, gel filtration and RP-HPLC to finally collect two peaks with highest ACE inhibitory activity with a retention time of 2.70 and 15.00, respectively. These two peaks were pooled and the peptides were characterized by LC MS/ MS. 12 peptides were chosen based on their similarity to the ACE inhibitory peptides which have already been reported by other studies with the help of ACE inhibitory peptide databases. These peptides were then given for peptide synthesis and their ACE inhibitory activity was assayed. Two novel peptides were identified from horse gram hydrolysate with DH of 40%.

Research Scholar: Shweta Rakesh Deshaware
Research Supervisor: Prof. R.S. Singhal
Studying the polymorphism in bitter taste receptor TAS2R38 in Indian population and approaches to debittering bitter gourd juice

Bitterness is considered as the most aversive taste and shunned by most consumers. However, many bitter foods have bioactive compounds required for a healthy nutritional status. The bitter taste receptor gene TAS2R38 is of great significance as it influences oral perception of various foods, has nutritional implications, and has shown association with various disease traits. Hence it is necessary to develop debittered versions of bitter foods with retention of bio-functional activities. The present work was undertaken toi) study the polymorphisms associated with TAS2R38 in healthy Indian population, and ii) formulatedebittered bitter gourd juice with enhanced antidiabetic potential.

1. Genetic and phenotypic variation of TAS2R38 gene in Indian population: A total of 393 healthy Indian adults were recruited for the study. Three polymorphic sites - rs713598, rs1726866 and rs10246939 were selected. Genotyping was done by polymerase-chain reactionrestriction fragment length polymorphism. Phenotyping was done using 6-n-propylthiouracil (PROP). Genotypic and phenotypic data suggested that Indian population had higher number of non-tasters than other population segments reported worldwide. BMI and food preferences neither significantly correlated with TAS2R38 genotypes nor with PROP taster status. Preference for umami tasting foods was observed.
2. Formulation of bitter gourd juice with enhanced bioactivity: E n z y m e assisted extraction using pectinase was optimized using response surface methodology (RSM) for enhancing boththe yield as well as the anti-diabetic potential of bitter gourd juice. The juices so obtained were also quantified for total and individual phenolics as well as the antioxidant profile. The optimized conditions increased the juice yield from 55% to 81.62 % (v/w), and also enhanced the □–amylase and □-glucosidase inhibition activity from … to22.80 and … to 58.52%, respectively. An increase in the content of total phenolics($p>0.05$) and DPPH antioxidantactivity from ….. to710 μg GAE/ ml and ….. to198 μg GAE/ ml, respectively, was also recorded.
3. Debittering of bitter gourd juice: Triterpene glycosidesmomordicoside K and momordicoside L cause bitterness in bittergourd. Attempts to reduce/mask bitterness of the same were successfully achieved on by addition of-cyclodextrin (0.25% to 2%) along with taste modifiers such as stevia and lactic acid. The debittered juice so develop was evaluated organoleptically as well as for anti-diabetic and antioxidant profile.Addition of 1.5 % □-cyclodextrinto bitter gourd juice demonstrated highest score for sensory acceptability, higher total phenolic content and antioxidant activity, and anti-diabetic activity Food Engineering and Technology I Institute of Chemical Technology I 51 at par with control juice. Investigations to study the effect at molecular level by NMR and FTIR indicated the formation of an inclusion complex. The debittered juice so developed was microencapsulated by spray drying using gum Arabic as wall material. The process parameters were optimized; the powder so obtained was reconstituted to contain similar amount of solids as in bitter gourd juice before spray drying, and evaluated as above.
4. Pasteurization of debittered bitter gourd juice: A comparative evaluation of pasteurization by thermal vis-à-visgamma irradiation was evaluated for obtaining the best pasteurization conditions (conforming with HACCP guidelines) for bitter gourd juice. Different time-temperature profiles and irradiation doses were tested and kinetic parameters – D and Z values were determined. Results indicated mild heat treatment at (65 °C, 204 s) was better than radiation and produceda microbiologically safe juice with retention of bioactivity and superior sensory qualities up to 3 months.

Research Scholar: Deepak Sunil Kadam
Research Supervisor: Prof.S.S.Lele
Studies on Extraction and Characterization of a Biomolecule from Defatted Seedcake of Nigella sativa and Lepidiumsativum

Black cumin (Nigella sativa) and cress (Lepidium sativum) which belong to the family of Ranunculaceae and Cruciferae respectively. These seed has received a considerable attention among researcher and consumers alike due to its functional health benefits associated with its consumption. Some of these health benefits include diuretic, antiinflammatory, anti-bactericidal anti-hypertensive, antidiabetic, anticancer and antioxidant effects. Black cumin and cress seeds are a rich source of lipid, polyphenol, protein, dietary or soluble fiber. The lipids obtained from the black cumin and cress seeds are rich in thymoquinone (TQ) and alphalinolenic acid respectively. After extraction of oil, it generates a residual cake as a by-product, which is the excellent source of biochemical compounds such as polyphenols, protein, dietary fiber,and carbohydrate. However, the majority of the biochemical compound has not yet been widely exploited for their value in human nutrition. Therefore, the present work undertaken to investigate the various biochemical compound, especially the bioactivities of polyphenolic, protein isolate as well as hydrolysate and their subsequent application.

1. Extraction and characterization of polyphenol and protein isolate from black cumin and cress seedcake: The effect of independent variable viz. such as ethanol concentration (%), extraction time (min), extraction temperature (ºC) and sample to the solvent ratio (w/v) on phenolic content. Whereas, alkali concentration, buffer to sample ratio, time and temperature on protein content were investigated. Each factor had an obvious effect on polyphenolic and protein content extraction. The phenolic extract of both the defatted seed exhibit strong antioxidant and antiinflammatory property. Further, the extract was characterized by LC-ESI-QTOF-MS/MS profiling and the results showed that the ethanolic fraction contains many important phenolics such as Kaempferol, Coumaroylquinic acid, p-Coumaroyl glycolic acid, Caffeic acid.
2. Studies on the effect phenolic compound as cross-linking agent in chitosan-based polymer: The black cumin and cressseedcake phenolic extract, as compared to tannic acid (TA), was evaluated for its effect on the film-forming ability of chitosan. These films were evaluated for their tensile strength, elongation, water vapor permeability (WVP), type of bonding, color, surface morphology and in vitro antioxidant activity release profile. Changes in absorbance intensity by FTIR indicated structural modification. The DSC 52 I Institute of Chemical Technology I Annual Report 2017-18 thermograph indicted a change in the melting point. SEM showed smooth and homogeneous surface cross-section composite film. The films exhibit dose-dependent and timedependent release of total polyphenols and antioxidant activity in the water, 50% ethanol, and 95% ethanol. These observations indicate a possible application of this seed polyphenol extract in active packaging based on the requirements of a particular packaging. This can help valorization of the black cumin and cress seedcake for dual functionality in films extensibility as well as nutraceutical appeal.
3. Fractionation and characterization of enzymatically hydrolyzed protein isolate under controlled condition: In this study, protein isolate extracted from black cumin and cressseedcakewas hydrolyzed with pepsin to obtain hydrolysates that were fractionated by membrane ultrafiltration into four molecular size fractions (30 kDa). The pepsin showed efficient at reducing the native black cumin and cressseedcake protein into low molecular weight peptide, which indicated the abundance of< 5kDa fraction after the membrane ultrafiltration of protein hydrolysate. Both the protein hydrolysate with < 5kDa fraction exhibit excellent antioxidant property. The fraction further characterizedby thermal, structural and functional activity. In addition, LC-ESI-MS/MS analysis of < 5kDa fraction resulted in the identification of peptide with the biological property. The findings of the study suggestthe alternative plant seed protein as a source of antioxidant bioactive peptides. The protein hydrolysate fractions (30 kDa) obtained from black cumin and cressseedcake was investigated for their potential as a carrier for curcumin because of their low solubility and instability in aqueous solution. The study reveals that 10-30 kDa fraction exhibit a higher hydrophobic interaction with

curcumin which was confirmed by the Fluorescence spectroscopy. The curcumin-complex possess an enhanced functional and antioxidant activity, which suggested a possibleutilization in food product formulation.

4. Synthesize an Ag nanoparticle (AgNPs) by a green biosynthesis approach from the seedcake waste: In the present study, anattempt had made to synthesize a silver nanoparticle (AgNPs) in a spherical structure by using black cumin and cressseedcake waste. The seedcake waste showed a presence of phenolic acid, flavonoid and terpenoid, which were used as a reducing agent to reduce silver to AgNPs. The AgNPs were characterized using scanning electron microscopy (SEM), DSC and Fourier-transform infrared spectroscopy (FTIR). The morphology and crystalline phase of the AgNPs were determined from X-ray diffraction (XRD) spectra and transmission electron microscopy (TEM). The spherical AgNPs formed were of 12 to 23 nm size with theface-centered cubic. The synthesized AgNPs exhibit good antibacterial properties against Gram-positive as well as Gram-negative microorganisms. A spherical AgNPs further evaluated for its effect on thefilm-forming ability of chitosan. These films were evaluated for their tensile strength, elongation, water vapor permeability (WVP). The result of this study encourages utilization of plant seed waste not only for synthesis of nanoparticles but also provides a utility to generated fruit waste to some extent.

Ph.D. (TECH) (BIOPROCESS TECHNOLOGY)

Research Scholar: Dattatray K. Bedade

Research supervisor: Prof. Rekha S. Singhal

Fermentative production, downstream processing and applications of acrylamidase

Acrylamidase (E C 3.5.1.4) is a hydrolase that can hydrolyze acrylamide to acrylic acid and ammonia. It is an attractive biocatalyst for several industrial applications including removal of acrylamide from food and environment. Acrylamidase is induced in presence of acrylamide as sole source of carbon and nitrogen. Literature on acrylamidase is scant. There is scope to investigate new and novel producers of acrylamidase. Hence, the present work was undertaken with the following objectives.

1. Isolation and identification of novel acrylamidase producer: Amongst the 25 cultures isolated from the garden soil, 2 isolates showed better acrylamide degrading potential than standard strains. These isolates were characterized morphologically, biochemically and molecularly,and identified as Anthrobacter sp. DBV1 and Cupriavidus oxalaticus ICTDB921. The16S rRNA sequences of these isolates were submitted to GenBank under accession no.KT002576 and KX852300, respectively. Cupriavidus oxalaticus ICTDB921 has been deposited at NCIM, Pune under accession no NCIM 5630.
2. Submerged fermentation (SmF): SmF for isolated strains using acrylamide as sole source of carbon and nitrogen in shake flask was optimized with respect to physicochemical parameters (pH, temperature and acrylamide concentrations) by using one factor at a time approach. Cupriavidus oxalaticus ICTDB921 showed higher productivity of acrylamidase than Anthrobacter sp. DBV1, and hence was selected for further studies. The degradation of acrylamide in the fermentation broth were analyzed by HPLC, FTIR and GCMS. The growth of biomass, substrate utilization, and acrylamidase production kinetics of Cupriavidus oxalaticus ICTDB921 followed Logistic, Weibull and Luedeking-Piret model, respectively.
3. Scale up study at 5L bioreactor: The scale up study was carried out in 5L fermenter wherein the effect of agitation (150-250 rpm) and aeration (0.25-0.75vvm)were studied.Batch bioreactor process with 200 rpm/0.5vvm gave maximum production of acrylamidase with 1.25 fold enhanced yield over shake flask study. The kinetics of growth, substrate utilization, and acrylamidase production of Cupriavidus oxalaticus ICTDB921 were similar as in shake flask study.
4. Downstream processing: Three phase partitioningas an approach to purify acrylamidase was unsuccessful. Other techniques such as ammonium sulphate precipitation (40-60% w/v), thermal treatment (55°C for 30min) and anion exchange chromatography (DEAE-cellulose) yielded 2.79, 3.75 and 4.16 fold purity, respectively. The purified acrylamidase was characterized for optimum pH/temperature (6-8/30-60°C), pH/thermal stability (6-8/upto 60°C) along with effect of different metal ions and amino acids on its activity. The molecular weight was determined bySDS-PAGE (~60kDa).
5. Applications of acrylamidase from Cupriavidus oxalaticus ICTDB921:

5a. Immobilization of acrylamidase for removal of acrylamide from roasted coffee: Chitosan coated calcium alginate beads were functionalized with citric acid as nontoxic cross linker and activated by EDC and NHS (1.66:1w/w) for covalent immobilization of acrylamidase. The optimum beads were obtained using 5% sodium alginate, 1.5% chitosan, and 0.6M citric acid. The beads were characterized by FTIR and SEM. The immobilized acrylamidase showed optimum pH/temperature of 8.5/65°C, improved pH/thermal/shelf stability, and retained 80% activity after 4 cycles. Haldane model could describe the degradation kinetics of acrylamide in batch study. In packed bed column, bed height, feed flow rate and inlet acrylamide concentration of 20cm, 1mL/min, and 100mg/L gave best results.

5b. Magnetic cross-linked enzyme aggregates of acrylamidase for biodegradation of acrylamide: Acrylamidase from Cupriavidus oxalaticus ICTDB921 were immobilized on amino functionalized magnetic nanoparticles (MNPs).MNPs of acrylamidase were prepared by cross-linking the enzyme with 5mM of glutaraldehyde for 90min at an enzyme: MNP ratio of 1.5:1 with 94% recovery. The prepared MNPs and acrylamidase-MNPs were characterized by particle size analysis, FTIR, XRD, SEM and vibrating sample magnetometer. Acrylamidase-MNPs showed a shift in optimum pH and temperature from 8 to 8.5 and 60 to 65°C, respectively, with higher pH and thermostability vis-à-vis free enzyme. Complete degradation of acrylamide (2100mg/L) was observed in industrial waste water under optimized conditions.

Research Scholar: Ashish Waghmare
Research Supervisor: Dr. S.S. Arya
Bioprocessing and applications of valuable products from microalgae

The global population is estimated to grow rapidly by 47%, i.e. 8.9 billion in 2050. This may lead to severe food, feed and fuel crisis in coming years. According to the data of Food and Agriculture Organization of the United Nations (FAO) (2014-2016); about 795 million people in the world, or one in nine, are suffering from chronic undernourishment. Microalgae are an emerging, one of the most promising long-term, sustainable sources of biomass. These can grow on barren land in fresh and salt water and does not compete with other food sources.The main components from microalgae such as lipids, protein and carbohydrate can be used as source of feedstock for fuel, food, chemical, textile, polymer and pharmaceutical industry. Considering all above points present research was aimed with following objectives:

1. Selection of microalgae strains: Chlorella pyrenoidosa,Scene desmusabundans, Spirulina sp., Dunaliellasalina, Nannochloropsisoculata and Euglena gracilis were collected from culture repository. Those strains were grown in reported growth medium and conditions. Biomass concentration, lipid content and total carotenoids were determined for all strains. Highest biomass concentration, lipid content and total carotenoids was found in Chlorella pyrenoidosa followed by that Dunaliellasalina.
2. Optimization of cultivation conditions for microalgae Chlorella pyrenoidosa and Dunaliellasalinawere studied for cultivation condition. In case of Chlorella p y r e n o i d o s a , v a r i o u s parameters were studied such as different growth medium, seed age, seed volume, batch time, pH, temperature, mixing, potassium nitrate concentration, carbon dioxide and light intensity for maximum biomass production. In case of Dunaliellasalina, various parameters were studied such as different growth medium, seed age, seed volume, batch time, pH, temperature, mixing, sodium chloride concentration, sodium nitrate concentration and light intensity for maximum biomass production.
3. Selection of best method for harvesting of 288 I Institute of Chemical Technology I Annual Report 2016-17 microalgae: Flocculation and bio-flocculation are most promising method of biomass concentration and were studied in the present work.
4. Physicochemical characterization of selected microalgae biomass : Biomass of Chlorella pyrenoidosa and Dunaliellasalinawere studied for proximate composition, amino acid profile, total carotenoid content (lutein and □-carotene concentration) and fatty acid profile.
5. Effect of various methods on cell disruption and extraction a. Ultra-sonication: Maximum cell disruption (94.58 %) was obtained at solid load (1 % w/v), duty cycle (80 %), power output (54 watts) and time (90 min). Further, effect of pretreatment (NaOH, H2SO4, cellulose and autoclave) was studied. b. Hydrodynamic cavitation (HC): Optimization of HC parameters for maximum cell disruption such as venturi or orifice device, pressure and solid load was studied.

Further, effect of pretreatment (NaOH and H2SO4) was studied. c. Extraction of lipids: Lipids from cell disrupted biomass was extracted using solvent (hexane and petroleum ether) and extraction efficiency was compared with Bligh and Dyer method. Further, fatty acid profile of different extracts were analyzed. d. Protein concentration by three phase partitioning (TPP): TPP was used forconcentration ofproteins from Chlorella pyrenoidosa. Effect of various parameters of TPP was evaluated to optimize the concentration of proteins in middle layer. To maximize protein concentration, various parameters were optimized such as solvent (t-butanol), ammonium sulphate concentration (40 % w/v), solid load (0.75 g/20 mL), pH (6), incubation time (20 min), slurry to butanol ratio (1:1.5) and enzymatic treatment.Using these optimized parameters, 78.1 % w/w protein concentration was obtained in middle protein concentrate phase. This protein concentrate was characterized for proximate composition, colour analysis, water holding capacity, oilholding capacity, foaming capacity, foam stability, amino acid composition, protein quality and thermal properties.

6. Applications of valuable products detailed food applications such as algal oil as deep frying oil and algal protein as emulsifier were carried out.

Ph.D. (SCI) (BIOCHEMISTRY)

Research Scholar: Anuradha Deorukhkar
Research Supervisor: Dr. Laxmi Ananthanarayan
Characterization and biochemical studies on isoflavones occurring in commonly consumed Indian legumes

Isoflavones are plant secondary metabolites, well-explored for the spectrum of physiological effects which they impart through estrogenic potential. Isoflavones are produced by the phenylpropanoid pathway, exclusively in legumes. Consumption of soybean and its products in some Asian countries is far greater than western countries which have resulted in decreased risk of recurrence of hormone-dependent cancers and mortality in Asian women as compared to women from the Caucasian and Hispanic origin. In the present study, Indian legumes other than soybean were explored as a source of isoflavones.

1. Isoflavone extraction and quantification: Isoflavones were extracted from 19 powdered whole legumes and 5 split decorticated pulse samples in 30 mL of 90% acidified methanol by sonication and shaking. Quantification was carried out using HPTLC and mobile phase toluene: ethyl acetate: acetone: formic acid = (20:4:2:1 v/v).Total genistein content of all legumes was found to be in the range of 0.60 to 8.65 mg per 100g whereas total daidzein content was found to be in the range of 1.10 to 30.37 mg per 100g in selected legumes.Total genistein and daidzein content of chickpea, soybean, white pea, pigeon pea (S, D), groundnut, black-eyed pea, double beans, white cowpea, chickpea (S, D) are higher (23 mg to 38 mg/100g) amongst the commonly consumed legumes.
2. Legume and isoflavone consumption by Indian population:Legume consumption survey was performed using a questionnaire on demographic information ofselectedhousehold. Per head consumption of isoflavone from each legume was calculated using the quantities of genistein and daidzein in legumes. Per capita per day isoflavone intake was found to be 18.22 mg/d. majority of which comes from pigeon pea (S, D) which is consumed by population in significantly high quantities of 371.6 g/month, followed by the second highly consumed legume chickpea (S, D) 329.7 g/monthhence, both of which were found to contribute 18% and 14% to total isoflavone intake respectively. Size of household, geographical origin and socioeconomic status had a significant impact on legume consumption and hence isoflavone intake of the selected Indian population.
3. Studies on the effect of germination on TFC and isoflavone content in legumes:Legume seeds were soaked in distilled water until completion of imbibition. Soaked seeds were wrapped in muslin cloth and germinated at 30° C, 90% RH, in dark, sampled at the intervals of 12hrs up to 48hrs and dried at 60°C. Whole seeds, seed coat, cotyledon, and radicle of 36 h germinated chickpea were separately stored at -20°C. Isoflavones were quantified by the previously optimized method and TFC was estimated by the AlCl3 method.Both TFC and isoflavone content was found to positively modulate during germination. A separate analysis of different tissues of germinating chickpea showed many folds increase in isoflavone content in the growing radicle that led to elaborate gene expression analysis.
4. Gene expression analysis of key isoflavone pathway genes in the radicle of germinating chickpea:Gene expression of flavonoid pathway genes was estimated by 'reverse transcriptase RT-PCR'by 2-ΔΔCT method, and correlated with TFC and isoflavone content in the radicle germinated in dark and light.Initial enzymes of phenylpropanoid pathway up to the synthesis of chalcone molecules (CaPAL, CaC4H, CaCHS, CaCHI) were ubiquitously expressed at all stages of germination and further induced in the 60h radicle on exposure to light. CaF3H, CaF3'H, CaF3'5'H expression were down-regulated in radicle but their expression was strongly upregulated in illuminated radicle indicating the photoprotective role of flavonoids produced by them.
5. Effect of commonly used processing methods on TFC and isoflavone content in the legumes: Pressure cooking, open pan cooking of 4 commonly consumed split pulses, 3 whole legumes, germinated green gram and roasting of groundnuts was optimized by subjective evaluation.Loss of flavonoids, as well as isoflavones, was higher in open pan cooking than pressure cooking may be due to prolonged processing time. Similar results were observed in the case of roasted groundnut which showed low TFC and isoflavones than raw seeds. Fermentation was also found to significantly decrease the flavonoid and isoflavone content after 9 h of incubation of idli batter.

   Split, decorticated pulses which are stapled food of Indian diet were found to contain significant quantities of isoflavones and hence, act as a source of phytoestrogens for Indian population. However, bioavailability studies in context to equol synthesis of the intestinal microbiota of Indian population would further clarify the utility of isoflavone from Indian legumes as phytoestrogens. Germination was found to instigate isoflavone synthesis in the radicle of legume seeds along with several other flavonoid molecules, which is further escalated on light exposure. Therefore, observed losses during thermal processing could be compensated by germination in case of whole legumes.

Research Scholar: Dhanashree Amane

Research Supervisor: Dr. Laxmi Ananthanarayan

Black gram, commonly known as urad, is an important leguminous crop belonging to genus Vigna and species mungo. It is a rich source of proteins and finds its application in several traditional food items. Black gram and its split dal being highly priced, its products stand a chance of adulteration with flours of cheaper legumes and cereals. Due to an increase in the number of food fraud cases, food safety has become one of the most urgent issues. Development of robust, accurate and sensitive techniques to detect adulterants from food is the need of the hour. Therefore, the present work was undertaken to develop methods and techniques for quantification of raw materials as well as for the detection of biological adulteration in traditional food products made from black gram. Quantification of rice and black gram dal proportion in readymade wet idli batters was carried out by exploring the differences in various biomolecules present in rice and dal. Starch (fresh batters), daidzein (fresh batters) and TIA (fresh and 12 h fermented batters) served as reliable indicators of raw materials. Use of different rice and dal varieties did not show any significant effect on these biomolecules. The method was successfully validated on coded samples as a part of blind study and market samples. Optimization of protein extraction from black gram using 11 different protocols and standardization of one-dimensional gel electrophoresis techniques such as Native PAGE and SDS PAGE was attempted. Extraction using Tris-HCl showed the best results in terms of protein yield and number of bands on the polyacrylamide gel with 12% acrylamide/bis crosslinking. Establishment of protein markers from adulterant flours using one-dimensional PAGE: Native PAGE did not reveal any useful information on unique proteins present in potential adulterant flours. Further, comparison of SDS PAGE patterns of these samples indicated unique proteins of 3 kDa and 14.4 kDa (rice), 2 kDa (maida) and 12 kDa (white pea) as potential markers of adulteration. Limit of detection (LOD) was estimated using model flour blends of black gram and adulterant flours, which was 2%, 1% and 10% for these adulterant flours, respectively. Optimization of two-dimensional gel electrophoresis (2D-GE) and protein fingerprinting of novel Indian black gram varieties was carried out. Analysis of 2D profiles (pH 4-7) of six novel black gram varieties using PD Quest software revealed the presence of 13 common proteins in all six varieties, having a differential expression, whereas 6 proteins were found to be uniquely expressed by 2 varieties. Detection of adulteration in black gram food products using 2D-GE: The 2D patterns of six black gram varieties, refined wheat flour, and white pea flour were compared and markers with MW 15.64 kDa, pI 4.89 and MW 21.5 kDa, pI 5.7 could be successfully established as indicators of adulteration, with LOD 5%. Detection of adulteration in black gram food products using Random Amplified Polymorphic DNA (RAPD): The potential of 8 random primers was assessed to amplify DNA and identify markers of adulteration. Two primers, AP 4 and R 108 generated the highest number of polymorphic

bands while lowest was reported by primer RP 4. Although RAPD analysis helped us in the identification of markers specific to each sample, the results showed inconsistency and poor reproducibility. DNA barcoding of novel Indian black gram varieties: Five DNA barcoding loci i.e. rbcL, trnH-psbA, ITS, rpoB and matK were employed for phylogenetic analysis of 10 black gram varieties and 3 Thailand varieties. The BLASTn search of the 10 black gram varieties showed significant alignments with 3 Thailand black gram varieties. The Kimura-2 model was used to calculate the genetic distance matrix and intra-specific divergence among the thirteen black gram varieties and phylogenetic analysis carried out using the neighbor-joining method. 3D protein structures of rbcL for 10 Indian black gram varieties were predicted by homology modeling using c1rcxH as a template with 100% confidence. The phi/psi Ramachandran plot showed that the structures were acceptable and of good quality (>90% residues with allowed conformations). Detection of adulteration in black gram food products using DNA barcoding: Eleven market samples made from black gram were analyzed to detect adulteration using rbcL, trnH-psbA and ITS loci. All samples showed 100% rate of PCR amplification and sequencing. The sequences of 10 market samples showed 100% similarity to Vigna mungo L. sequences in the NCBI database, whereas 1 market sample showed maximum similarity with the sequence of Triticum aestivum L., indicating the presence of wheat flour/ refined wheat flour in the sample. Among the 3 loci, rbcL and trnH-psbA proved to be the best loci for detection of adulteration in black gram products.

Ph.D. (SCI) (BIOTECHNOLOGY)

Research Scholar: Prajakta Insulkar
Research Supervisor: Prof.S.S.Lele
Studies on production of an exopolysaccharide from halotolerant bacteria and its biotechnological application

Solar salt pans of Ribandar, Goa, India were screened for exopolysaccharide (EPS) production potential.The 'Isolate 10' produced maximum EPS and identified as Bacillus licheniformis PASS26. Optimizationstudies with Central Composite Design could yield 6.67 g/L of EPS in 60 h. Carbon source, nitrogensource, common salt and Na2HPO4 levels were observed as most influencing factors for EPSproduction. The exopolysaccharide was purified with gel permeation chromatography. The FTIRanalysis confirmed the presence of hydroxyl group, glycosidic linkages and carboxylic bonds in EPS.The low molecular weight (56kDa) polysaccharide analysed for monosaccharide composition confirmedthe hetero-polymeric nature of EPS with 18.44% glucose, 9.89% galactose, 16.15% fructose, 27.32%mannose and 28.18% galacturonic acid. Morphological study by SEM demonstrated less porous flakeslike structure. Elemental analysis revealed presence of small quantity of nitrogen, indicating partiallycharged nature of polymer. The X-ray diffraction pattern and differential scanning calorimetricobservations reflected semi-crystalline nature. Thermal and rheological studies displayed moderatethermal stability and semi-viscous nature respectively. Studies on functional properties displayedconcentration-dependent water solubility with good water (98.8%) and oil holding capacity (101.7%).Biological properties demonstrated potent free radical scavenging activity, adequate antibacterialpotential, moderate emulsification activity with excellent stability, in-vitro anti-tumour activity andwound healing efficiency. Based on these findings, the present study concluded that the wild strain,isolated from the less exploited extreme marine environment, is capable of producing an appreciableamount of exopolysaccharide with significant functional and biological properties for potentialapplications in food and pharmaceutical industries.

Research Scholar: Majeed Jamakhani
Research Supervisor: Prof.S.S.Lele
Study on isolation and characterization of allergens of indam variety of tomatoes

Tomato (Solanum Lycopersicum) is a major component of diet around the world and is 2 intensively consumed. Tomato allergies increasing and affecting around 12.5% of the 3 population in India with severe asthma. It was found that the prevalence of tomato allergy 4 ranges from 1-24% in different parts of the world. Several tomato allergens have been 5 described to date but the clinical relevance of each of these allergens is not clear, with the 6 exception of Profilin. However, to date, there is no report available on the efficient 7 characterization of allergens of Indo American hybrid (INDAM) variety tomatoes. 8

INDAM proteins from the peel, pulp and seeds are extracted and separated by Sodium dodecyl 9 sulphate Poly acrylamide gel electrophoresis and performed immunoblotting with sera of 10 allergic patients. Blotting results showed that presence of four allergens Sola L1 (14 kDa), Sola 11 L2 (56 kDa), Sola L3 (9 kDa) and Sola NP24 (24 kDa). Thermal stability of these allergens 12 showed Sola L3 is highly stable and analysis of presence of allergens in unripen and ripen 13 tomato showed the presence of Sola L3 in unripen compare to ripen tomato. Further analysis 14 of the presence of an allergen in commercial ketchup showed the presence of Sola L3 compare 15 to other allergens in Indian marketed ketchups but absence of allergens in USA based Heinz 16 ketchup. 17

The highly stable allergen Sola L3 is further cloned with PET21b in host DH 5□ by identifying 18 gene encoding region and designing specific primers by DNASTAR software. The plasmid 19 was isolated and expressed in expression host BL21 DE3. This system is grown in Lysogeny 20 broth (LB) media. From the overnight grown culture inoculum is taken and inoculated in fresh 21 Lysogeny broth media. Recombinant SOLA L3 protein expressed was induced with Isopropyl 22 □-D-1-thiogalactopyranoside. Recombinant Sola L3 is further blotted with sera of patients and 23 observed the clear dark band at 9 kDa region. Further its docking analysis with human antibody 24 2VXQ showed the hydrogen bonding and amino acids involved in interaction between them. 25

In an Insilico analysis of epitope Sola L1, Sola L2 Sola L3 and Sola NP24 exhibited possible 26 regions which involved in interaction with B cell, T cell, and antibody regions. Sequence 27 analysis of these allergens revealed out of 20 amino acids only few amino acids involved in 28 interactions. Further docking analysis with antibody 2VXQ for molecular characterization 29 indicates involvement of some of the residues and those are same as compared to the amino 30 2 acids of epitopes predicted by epitope analysis. Most frequent and common amino acid residues 31 involved in interaction are Leucine(L), Alanine(A), Serine(S), Phenylalanine(F). 32

Recombinant Sola L3 and similar Sola L3 allergens from database, both are used for docking 33 with human antibody 2VXQ to understand is there any common type of amino acids from 34 antigens contributing in interaction and which type of bonding is contributing in interaction. 35 Three dimensional structures are modelled for both Sola L3 antigens and the docking analysis 36 revealed that there are common residues namely Serine, Phenyl alanine from both recombinant 37 Sola L3 and Sola L3 from database are involved in interaction with antibody 2VXQ. 38 In order to understand role of lipids in passage of allergen we used 16 Lipids from different 39 parts of body like skin, brain, hair and performed structural level docking study to understand 40 which type of lipids involved in interaction with Sola L3 and its isoforms. Molecular docking 41 and simulation by Schrodinger tool showed out of 16, the four lipids are highly interacted with 42 Sola L3. Simulation analysis of these four docking showed hydrogen bonds are major 43 contribution in interaction compare to hydrophobic and water bridges. Detailed analysis 44 revealed Arginine (ARG), Glutamate (GLU) and Glutamine (GLN) are most common amino 45 acids of allergen which are involved in interaction with Lipids. 46

This study showed four allergens Sola L1, Sola L2, Sola L3 and Sola NP24 are present in Indo 47 American hybrid tomatoes and among them Sola L3 is highly reactive to patients we have 48 taken. Sola L3 is cloned in expression host BL21 DE3 and purified by IMAC and at structural 49 level it revealed the presence of Leucine, Alanine, Serine and Phenyl alanine at the active sites 50 when docked with antibody. Also docking and simulation of lipids and Sola L3 pin point 51 interaction takes place over the surfaces. This study makes significant contribution in studying 52 allergens of INDAM and their interaction at molecular level.

Classification: Molecular Biology, Biotechnology, Allergy 55
Keywords: Protein, Allergen, Sola L3, Docking, Simulation

Research Scholar: Momin Bilal
Research Supervisor: Pro.U.S.Annapure
Studies in fermentative production and downstream processing of Arginase

Arginase is a hydrolytic enzyme responsible for the conversion of L-arginine to L-ornithine and urea. It is an anticancer enzyme have been alsoreported to subserve a number of different roles in different tissues ofvariousorganisms. Interest in the arginase as a possible regulatory enzymes is growing due to its potential for regulating the availability of arginine for the synthesis of NO, polyamines, agmatine, proline and glutamate. The present work was undertaken to optimize fermentative production of arginase using mutant strains ofBacillus licheniformis M09and its possible application in

suitable areas.Initially, an analytical method for arginase assay was developed based on complex formation between urea and p-dimethylaminobenzaldehyde (DMAB) using HPTLC.

Screening and strain improvement of arginase producer: Amongst the 11 cultures isolated from the ICT garden soil and water from Vajreshwari werescreened for their potential to produce arginase but none of them gave significantyield. Further 174 organism have been screened (Insilico) for arginase producer by PESSM (phylogeny based enzyme substrate specificity method). Suggested standard strains by PESSM method were procured form the NRRL and maximum arginase producing strain (Bacillus licheniformis NRRL 1264) was further improved by random mutagenesis.

Investigation of the cell disruption methods: Lack of reports on intracellular release of arginase prompted us to first develop cell lysis strategies. An efficient cell disruption method forarginase extractionfrom Bacillus licheniformis M09was developed by screening various physical, mechanical and chemical methods . Among these methods, ultrasonication was found to be most effective which was further optimized by one factor at a time (OFAT), evolutionary operation (EVOP) and response surface method (RSM) approach. Ultrasonication for 2-5 min having a suspension volume in the range of 12-20 mL at a radio frequency power between 30-70 W appeared to be the most effective extraction technique for arginase. The arginase yield decreased in the range of 50-70 W of RF power/16-20mL suspension volume and 4-5 min sonication time. EVOP predicted a maximum arginase extraction of 3,910 IU•L-1 at 2 min sonication having 16 mL suspension volume at 30W RF power. However, response surface optimization suggested an optimized condition of 3 min sonication having 14.5 mL suspension volume at 35 W RF power in which the maximum arginase activity in the medium was 3,600 IU•L-1.

Submerged fermentation (SmF): Mutant Bacillus licheniformis M09 was selected for optimization of various environmental and nutritional factors affecting arginase production by traditional OFAT approach. Using this approach, arginase production increased from 3.9 IU/mL to 13.2 IU/mL. Further Statistical studies using Placket-Burman and RSM-CCD were used for optimization of media component to enhance the production of arginase.

Scale up study: Bioreactor studies for arginase production were carried out in Sartorius BioStat B5 fermentor having a capacity of 5L and a working volume of 3L wherein the effect of agitation (200-400 rpm) and aeration (0.5-1.5vvm) were studied. The batch mode conditions using 300 rpm and 1 vvm gave the highestarginase production over shake flask study. In order to improve the productivity of biomass, other strategies such as fed-batch and semi-continuous modes of fermentation were employed.

Downstream processing and characterization of arginase: The enzyme was purified using ammonium sulphate precipitation (60-80% w/v), strong anion exchange chromatography (Q-Sepharose) and weak anion exchange chromatography (DEAE-Sepharose) yielding 2.47, 4.26 and 6.97 fold purity, respectively. Further SDS-PAGE was performed to determine the molecular weight (~33 kDa). The purified arginase was then characterized for optimum pH and temperature along with the effect of different amino acids and metal ions on its activity.

Synthesis of Ag nanoparticle (AgNPs) by a green approach from the fermentation waste: In the present study, an attempt had been made to synthesize silver nanoparticle (AgNPs) using fermentation waste. The AgNPs were characterized using scanning electron microscopy (SEM),differential scanning calorimetry (DSC) and Fourier-transform infrared spectroscopy (FTIR). The crystalline nature and morphology of the AgNPs were determined from X-ray diffraction (XRD) spectra and transmission electron microscopy (TEM). The spherical AgNPs formed were within the size range of 10-30 nm. FTIR measurements assured the presence of effective functional molecules which could be responsible for synthesis and stabilizing the AgNPs.

Application of Arginase and AgNPs: The results revealed a strong concentration-dependent cytotoxicity of arginase against human breast adenocarcinoma cells (MCF-7). The outcome suggests the possible application of thisarginase as a therapeutic agent for cancer treatment.In vitro assay performed against normal HaCaT cellsfrom adult human skin showed fair proliferation of cells which revealed wound healing potential of arginase. The biosynthesized AgNPs efficiently degraded MB dye with visible light irradiation and also proved to be an excellent antimicrobial as well as an anticancer agent. The AgNPs were further evaluated for its effect on the film-forming ability of chitosan. These films were estimated for their tensile strength, elongation, water vapor permeability (WVP) and antibacterial properties against Gram-positive and -negative foodborne pathogens. The result of this study not only endorsesthe suitability of arginase as agent to extend shelf-life in food packaging and food safety applications but also provides the utility of generated fermentation waste to some extent.

Research Scholar: Aniruddha Vaidhya
Research Supervisor: Prof.U.S.Annapure
Studies on isolation and characterization of bacteriophages for their application inbiosensing and biocontrol

Bacteriophages are intracellular parasites that kill their bacterial hosts. Their anti-bacterial activity can beexploited for various applications such as biocontrol, bioremediation, biosensing, bacteriophage therapyetc.In this study, bacteriophages were isolated against various bacterial hosts such as Salmonella,Pseudomonas, Escherichia and Klebsiella from water and soil samples. Phages were enriched againsttheir hosts to obtain pure high titre lysates. The phages were characterized for morphology, host range,genome size and their sensitivity to pH, high temperature and chloroform.Highly specific phages isolated against typhoidal serovars of Salmonella were used in a resazurin-basedviability assay to design a biosensor for detection and identification of typhoidal Salmonellae in bloodculture samples. The biosensor was able to successfully identify and differentiate between threetyphoidal serovars of Salmonella with high reproducibility and sensitivity, and the results were verifiedby Polymerase Chain Reaction amplification for invA gene, serological tests with commercial antiseraand biochemical tests using Triple Sugar Iron slants. The biosensor worked at room temperature, and canalso be used as a standalone detection assay, drastically reducing cost and instrumentation.A high-titre cocktail of two bacteriophages was used to reduce surface contamination of Escherichia coliin carrots. The cocktail was able to cure existing contamination, as well as prevent new contaminationwith a reduction of as high as 4-log bacterial colony forming units. Removal of > 99.99% bacteriophagesused for treatment under running tap water was also successfully demonstrated.

M. TECH. (FOOD ENGINEERING & TECHNOLOGY)

Research Scholar: T. Abishekapandian
Research Supervisor: Dr. Snehasis chakraborty
Quality Monitoring of Paneer during Cold Chain using Enzymatic TTI

Paneer, an Indian soft cheese, is a highly perishable dairy product with a typical shelf-life of maximum 6 days while being stored at 10 °C and the same appears to be spoiled within 24 hours at 30 °C. In this connection, an effective monitoring of the temperature profile during the storage and distribution of paneer is crucial while estimating its shelf-life. The present study focuses on the application of the microbial □-amylase based enzymatic TTI for monitoring the quality of the paneer. In the first phase, the changes in the various quality parameters (texture, color, titratable acidity, pH, microbial) of high, medium and low-fat paneer were monitored continuously at seven different storage conditions (4-15 °C). The changes in the quality attributes were modeled using the nth order reaction kinetics. From the estimated kinetic parameters, the pH change of the paneer appeared to be most thermal sensitive one with an activation energy of 110.3±0.2, 109.3±1.9 and 110.2±0.2 kJ•mol-1 for high, medium and low fat paneer respectively. The enzymatic TTI with a comparable activation energy of 112.2±13.1 kJ•mol-1, was employed for further validation of the experimental data. A high correlation (R2 > 0.9) was obtained while comparing the TTI responses with the experimental counterparts (pH change of the paneer) of high and low fat paneer. This emphasizes that TTI can be effectively used as quality monitoring tool for the paneer during the cold chain.

Keywords: Paneer, enzymatic TTI, shelf-life, nth order kinetics, activation energy, quality

Research Scholar: Sneha Awasthi
Research Supervisor: Prof. Rekha S. Singhal
Ginger Candies: Process Optimization and Product Development

The purpose of this study is to develop shelf stable osmotically dried ginger candies by process optimization. Sugar and citric acid were the selected ingredients for processing ginger in candies. Ginger (Zingiberofficinale; variety Satara) was peeled, cut into pieces of approximate thickness of 4-5 mm and blanched in 2% citric acid solution for 15-20 min. The blanched ginger slices were further autoclaved in a 75□B sugar solution (sample/solution ratio of 1:10) at 15 psi for 15 min. The autoclaved ginger slices were used for further study on osmotic dehydration and drying kinetics. Mathematical modelling for osmotically dehydrated ginger slices was developed in order to predict the vacuum-drying characteristics

of osmotic ginger candies. On the basis of physicochemical, analytical and sensorial parameters, an immersion time of 9 h at 30□C for osmosis, and vacuum drying of 6 h at 60□C were optimum to produce ginger candies with the desired characteristics. The optimized ginger candies were packed in low density polyethylene (LDPE) airtight pouches and subjected to storage stability study at 4, 25 and 35□C and evaluated for 60 days with 10 day time interval. These studies showed that the optimized candies were stable up to 60 days, and best results were observed under refrigerated conditions. Further, the technical feasibility to reuse osmotic solution was studied by maintaining the same TSS. The TSS of recovered osmotic solution was maintained by direct addition of freshly prepared sugar syrup of higher □Brix. It was further used for preparation of ginger candies and could be used up to 4 cycles. Additionally, a comparative study between the optimized ginger candies and commercial ginger candies revealed that developed ginger candies were richer in bioactive components and sensorial attributes than that available commercially.

Keywords: osmotic dehydration, ginger candies, vacuum drying, sugar solution, syrup reusability, mathematical modelling, storage stability, bioactive components

Research Scholar: Harshal
Research Supervisor: Prof. S. S Lele
Novel Products from Fruit Seeds

The processing of fruits results in high amounts of waste materials such as peels, seeds, stones.Food security is an issue of great importance for developing country like India. In areas of foodscarcity, it is essential to use every single food resource available in order to solve this problem.The aim of this project was to utilize regionally available processing waste materials (seeds) offruits like pomegranate, jackfruit and mango to prepare novel food products.Pomegranate seeds were used to extract pomegranate seed oil. Oil obtained was liquid butconverted to semi-solid at temperatures lower than room temperature having yield of 17.6%.Chemical analysis focused on the important parameters that determine the quality of the oil.Fatty acid profile showed that oil is rich in punicic acid– a conjugated isomer of □-linolenic acid.Both jackfruit seeds and mango kernel majorly contain carbohydrate (rich in resistant starch),protein, minerals and fibers. The seeds were found to be in the category of low GI, with richsource of antioxidants having 95% and 55% DPPH scavenging activities for mango and jackfruitseeds respectively. Relatively low GI biscuits were prepared by replacing 50% refined wheatflour with jackfruit seed flour and mango kernel flour. Nutritional characterization of formulatedbiscuits showed that they are good source of nutrients. The 50:50 ratio biscuits were preferred bypanelists for colour, texture, flavour and overall acceptability. Diabetic friendly sugar freebiscuits were also prepared by replacing sugar in the recipe with sucralose and a bulking agent.

Keywords: food security, mango kernel, jackfruit seeds, pomegranate seed oil, value Addition,diabetic friendly biscuits

Classification: Food processings, Product development, Value Addition

Research Scholar: KishoriPanmand
Research Supervisor: Dr. Laxmi Ananthnarayan
DEVELOPMENT OF SUGAR-FREE AND REDUCED-FAT INDIAN TRADITIONAL CONFECTION

Sugar and sweet consumption have been popular and intrinsic to Indian culture, traditions, and religion from ancient times. Most of the Indian sweets contains high amount of sugar and fat. Sedentary lifestyle, change in dietary pattern and consumption of excess quantities of fat and sugar has been associated with serious health problems such as obesity, cardiovascular diseases and diabetes etc. Besanladduis most popular sweet consumed in India and also contains high amount of sugar and fat. In this view, a sugar free and reduced fat besanladduwas sought to be developed. Sweeteners were screened and sweetness intensity was determined using multiple difference test. Stevia and thaumatin were screened out due to their bitter aftertaste, while acesulfame-k, sucralose, maltitol, mannitol and isomalt were selected for further studies with optimized sweetness intensities as 130, 300, 0.7, 0.7, 0.35 times than sucrose respectively. Control besanladduformulation was optimized using D-optimal mixture design as 50% besan, 25% sugar and 25% ghee against the responses (sensory, texture and color). Complete replacement of sugar by sugar alcohols (maltitol, mannitol and isomalt) in besanladdudisturbed the ratio of ghee to sugar and flour, therefore affected its sensory, color and hardness. Then sugar was completely replaced by an equal amount of sugar alcohol and sweetness equivalent to sucrose was maintained by addition of intensive sweetness. Where, maltitol plus sucralose combination stood well in terms of sensory, texture and color properties compared to control besanladdu. Separate study was carried out to reduce the fat content in besanladdueither by replacement of besanwith low OAC flours and modifying process of preparation of besan. Rajgiraflour was having least OAC followed by nachniflour, udad dal flour, whole moong flour, soya flour and besan. OAC of selected flours (besan, rajgiraflour, moong flour, nachniflour, uradflour and soya flour) was found to be increased with increase in roasting time. Laddumade by completely replacing besanwith whole moong flour, urad dal flour and nachniflour were unacceptable by sensory panel member. Laddumade by 50% replacement of besanby rajgiraand soy flour were having maximum sensory acceptance and with potential to reduce fat in laddu content was depicted by its texture property. The reduction of fat content from 25% to 22% in soya flour plus besan(50:50) ladduand 25% to 19% in rajgiraflour plus besan(50:50) laddu was achieved with minimal effect on its sensory and texture and color properties. Further study done on the reduction of OAC of besanby roasting of split Bengal gram instead of besan. The reduction in fat content from 25% to 15% was achieved in besanladduprepared using this 9 flour of roasted split Bengal gram. So, final optimized sugar-free with reduced-fat besanladducontains maltitol plus sucralose as sugar substitute and 15% fat. The glycemic index and energy value of optimized sugar-free with reduced fat besanladduwas significantly less than that of control besanladdu. No significant changes observed in hardness of control and sugar-free/sugar-free reduced fat besanladduobserved during 90 days of storage period. No microbial growth (total plate count) was observed during 90days of storage in sugar free and sugar-free with reduced-fat besanladdu, whereas microbial growth was observed in control ladduafter 70 days of storage period. Indian vegetarian diet lacks omega-3 fatty acid. Flaxseed is one of the vegetarian sources of omega-3 fatty acid, thus used in development of flaxseed ladduwith jaggery as a sweetening and binding agent. Sensory acceptability of flaxseed ladduwas improved by addition of tamarind paste, chocolate and dates to it. These flaxseed ladduvariants were packed in HDPE and metallized film (with and without vacuum) and oxidative stability was checked in terms of conjugated dienes. Flaxseed ladduvariants packed which were uder vacuum did not show a significant difference in conjugated dienes during 40 days storage period. Flaxseed-chocolate ladduwhich were packed in HDPE without vacuum showed a significant increase in conjugated dienes. Calculated amount of ALA per flaxseed ladduwas sufficient to meet the daily requirement of omega-3 fatty acid/ALA of all age group.

Research Scholar: Kapil Rai
Research Supervisor: Prof. Rekha S. Singhal
Development of Flavored Sugar Cubes Using Ginger Oleoresin

Encapsulation is a process being used since decades to entrap food ingredients such as flavours, lipids, and carotenoids within suitable matrices. Co-crystallization is a method of encapsulation in which an active ingredient is incorporated in sucrose followed by simultaneous crystallization of both components; second ingredient may be in an amorphous state. During co-crystallization, the structure of sucrose gets modified from perfect crystals to irregular agglomerated. Increased void space and surface area of sucrose provides a porous base for incorporation of active compound. Ginger oleoresin emulsified with gum acacia was co-crystallized with pharma grade sugar to prepare flavoured sucrose cubes. The co-crystals with and without ginger oleoresin were characterized for crystallinity vis-à-vis pure crystal sucrose. Co-crystallized sucrose cubes showed decreased crystallinity as compared to crystal sucrose. The active components of ginger oleoresin such as [6]-, [8]-, and [10]-gingerols, as well as [6]-shogaols were quantified by HPLC. The encapsulation efficiency of [6]-gingerols was 45.59% in co-crystallized sucrose cubes. These flavoured sucrose cubes were packed in amber coloured glass bottles and evaluated for stability studies at three different RH and temperatures. The active components [6]-, [8]-, and [10]- gingerols, as well as [6]-shogaols in the freshly prepared flavoured sugar cubes, and in sugar cubes stored under extreme condition of storage at 45°C under all the RH were quantified by HPLC. The study of rate kinetics of degradation of [6]-, [8]-, and [10]-gingerols and formation of [6]-shogaol was done. This sucrose-ginger cube has potential applications in flavoured tea.

Keywords: Encapsulation, co-crystallization, gum acacia, ginger oleoresin, flavoured sugar cubes, crystallinity.

Research Scholar: Rishab Dhar
Research Supervisor: Dr. Snehasis chakraborty
Pulsed light treatment of mixed tropical fruit beverage

Amla is a minor fruit with limited application under processed products. Amla juice is known to have 20 times more vitamin-C than other citrus fruits. Even though it is rich source of bioactive compound like vitamin-C, polyphenols and antioxidants, amla juice is not popular as a beverage or a part of blend because of its astringency and acidic taste. Thus, blending it with other fruits with dominant flavour like pineapple and coconut water as pH balancer and to replace water, results in a new juice blend with the enhanced sensory and nutritional profile. Traditional thermal pasteurization is a reliable preservation technique for easily perishable juices but that compromises the nutritional and sensory qualities of the juice. Consumers demand high-quality processed foods with minimal changes in nutritional and sensory properties. Pulsed light (PL) is one of the novel non-thermal techniques that have the ability to assure safe food by inactivating microbes and enzymes and at the same time retain food quality attributes better than traditional thermal processing. The aim of the present study is to formulate a mixed fruit beverage, to understand the effect on various quality parameters with the kinetic behaviour of the important quality parameters for mixed fruit beverage samples due to non-thermal PL treatments along with conventional thermal analysis as benchmark. The mixed tropical fruit beverage was formulated as 13.6/ 56.7/ 29.8 (amla/ pineapple/ coconut water %v/v) through sensory analysis and optimized with D-optimal mixture design and fuzzy logic. PL treatments were carried out for 75 treatment combinations with three independent parameters i.e. voltage (1800, 1950 and 2100V), number of pulses (2, 47, 94, 140 and 187) or corresponding holding time (1, 30, 60, 90 and 120 sec) and distance (2.4, 6 and 9.6 cm). Subsequently, thermal treatment was also performed for 25 time (1 s, 2.5, 5, 7.5, and 10 min) and temperature (50, 60, 70, 80, and 90 °C) combinations. Both PL and treatment caused treatment have significantly reduced microbial load and enzyme activity in the beverage, and especially 5D reductions was achieved for both thermal and PL treatment in terms of aerobic mesophiles (AM) and yeast and molds (YM). PL has shown an improved retention of colour and ascorbic acid (AA) as compared to thermal treatments. Opposite to thermal processing an increase in phenolic content and antioxidant capacity was observed after PL treatment. Impact of thermal inactivation/ degradation of microorganisms, enzymes, AA, and loss of visual status (colour profile) were much greater than PL treatment. Successful application of primary (kinetic) modelling for all the important quality parameters like microbial inactivation (Weibull model), enzyme inactivation (nth order kinetics), and ascorbic acid degradation (nth order kinetics) was observed. In case of both PL and thermal treatment polyphenoloxidase (PPO) enzyme and microbial group of YM were the most resistive, along with AA as the most sensitive bioactive nutrient. So it was concluded that PL has a potential as an excellent alternative to conventional thermal processing of beverages. A secondary model under PL domain for predicting inactivation/ degradation rate constant (k) via input voltage (V), distance from the lamp (x) and fluence based rate constant (kF) was successfully developed by combining Beer-Lambert and Ohm's law. - xv–

Keywords: Pulse Light, Beverages, Fuzzy Logic, Kinetics, Secondary modeling

Research Scholar: Rutumbara Rajendra Haripurkar
Research Supervisor: Dr. Laxmi Ananthnarayan
Studies in extraction of carotenoids from Selected plant sources

Growing demand for eco-friendly and non-toxic pigments has led to exploration ofunderutilized sources having considerable amounts of carotenoids. D.regia, C. indicaand Cucurbita were selected as potential candidates for carotenoid extraction. Carotenoids are being currently extracted by conventional techniques, while exploration of alternative methods could lead to greener techniques which could increase the yield as well as decrease the timeand cost. Hence, exploration of newer techniques for extraction of carotenoids from selectedsources was undertaken. The objective of the present work was to obtain a good yield ofcarotenoids from selected sources, using EAE, UAE and MAE techniques. Various parameterssuch as concentration of enzymes and time of incubation were optimized in case of EAE. Usingultrasonication, effect of power, duty cycle, extraction time and solvent was optimized. MAEwas optimized with respect to power, extraction time and solid to solvent ratio. The resultsindicated that when carotenoid pigment yield obtained using different methods were comparedwith the yield of pigment from respective sources, it was found that microwave assistedextraction method had maximum efficiency as well as required less time. But UAEE approachgave the best results amongst all. Vegetable oils were explored as novel solvents but overallyield of carotenoid obtained was low.

Keywords: D.regia, C. indica, Cucurbita, solvent extraction, enzyme assisted extraction,ultrasound assisted extraction, and microwave assisted extraction

Research Scholar: Niveditha NV
Research Supervisor: Prof. U.S. Annapure
EFFECT OF COLD PLASMA PROCESSING ON THE PHYSICOCHEMICAL PROPERTIES OF PALM OIL

Oils and fats are the essential ingredients of the foods system which are highly sensitive to the various thermal processing techniques used in the food industries. Several process improvements and developments have been made to meet the innumerable needs of various food industries which focus on producing products to handle the consumers' demands of food diversity along with quality satisfaction. In this way, many non – thermal techniques have been developed and are in use in the mainstream because of their efficiency in overcoming the disadvantages of thermal processing techniques. One such well – known technique with various applications in the food industry is the cold plasma processing. Hence, there is a need to study the effect of this nonthermal cold plasma treatment on one of the majorly used lipid system. Palm oil is the most widely used frying oil in India. It contains 50 – 50 composition of saturated and unsaturated fatty acids. In this study, the atmospheric cold plasma treatment is carried out at two different powers of 50 and 60 watts for two different time periods of 30 and 45 minutes during which the palm oil surface is expected to interact with the generated reactive species at ambient temperature and at a lower pressure of around 0.2 mbar. Within a shorter span of treatment time, the interactions have resulted in the variation of physicochemical properties like moisture, colour, turbidity, cloud point, iodine value and fatty acid composition. The treatment had not resulted in a significant difference between the control and plasma treated samples in values like saponification value, triacylglycerol value, acid value, and free fatty acid value. While there was about 3% increase in the melting point from 34.1 ± 0.17 oC to 35.23 ± 0.25 oC after 60 watts treatment for 45 minutes, there was around 0.9% increase after 50 watts treatment for 30 minutes. The peroxide value and anisidine value started increasing slowly immediately after cold plasma treatment but still, the values were within the range. There was a significant decrease in the iodine value (56.31 ± 0.26 g of I2/100g of oil to 51.56 ± 0.01 g of I2/100g of oil) due to the cold plasma treatment. The TOTOX value which represents the oxidative stability of the palm oil had increased from 12.77 ± 0.93 for the control sample to the maximum value of 16.38 ± 0.28 which was for the 60 watts power treatment for a time period of 45 minutes. It can be evidently seen from the physicochemical properties variation that the cold plasma treatment is in direct relationship with treatment power and time in most of the cases. Since the plasma discharges are made with atmospheric gas in which oxygen is present as one of the component, the reactive oxygen species could have resulted in lipid oxidation and ultimately changed these values. From the fatty acid profile of the untreated and treated palm 8 oil, it can be seen that there is a significant decrease of about 2 - 3% in unsaturated fatty acids like oleic and linoleic acid after cold plasma treatment. The Rancimat results also coincide with the above results by showing a decrease in the induction time of treated samples when compared to the untreated samples. The 1H NMR and FTIR results did not show any significant change in the structure of the fatty acid between the control and treated samples since the fatty acid profile of the oil had suffered only negligible changes in the structure due to oxidation. Most of the values which represent the oxidative state of the palm oil have found to be within the range of acceptable oil quality. Cold plasma processing had also resulted in changes in the storage stability of the palm oil, which is seen in the fatty acid profile of treated palm oil after 1 week of storage. The storage for a period of one week had also resulted in a change in the oxidative state of the treated and control sample due to the after effect of the cold plasma treatment. No considerable difference is seen in physicochemical properties of control sample when analysed after a week whereas the oxidative stability of the treated samples had suffered a decrease in their value when measured after a week due to the reactive oxygen reaction during cold plasma treatment. Hence, cold plasma treatment could have resulted in some process mechanism in the palm oil which makes cold plasma as an effective technique to find its own application in the edible oil industry.

Keywords: Cold plasma, palm oil, lipid oxidation, fatty acid profile, oxidative stability

Research Scholar: Krutika Bhangale

Research Supervisor: Prof. U.S. Annapure

EFFECT OF COLD PLASMA TREATMENT ON ACACIA CATECHU GUM

Acacia catechu exudate is an important polysaccharide with wide range of applications in food aswell as other industries. Many gums suffer from various deficiencies such as low solubility, poorthermal stability and low mobility of its solutions, which have markedly limited its applications.Thus, gums are required to be modified in order to alter their physic-chemical properties bymodification through derivatisation of functional groups, grafting with polymers, cross-linkingwith ions etc. However, modifications by chemical methods have some limitations such aspresence of harmful residues within the final product due to used chemicals. Therefore, nonchemicalmethod such as Cold Plasma treatment can also be used for modification of gumswhich is Safe i.e., no formation of any harmful residues, effective at ambient temperature,minimum effects on nutritional & sensory quality parameters of foods.The objective of the study was to isolate, purify and modification of plant gum exudate derivedfromAcacia catechu using cold plasma treatment. Plant gum exudates were collected fromdistrictSolan and Shimla of Himachal Pradesh. The purification of gum exudates was done byemploying alcoholic precipitation. The gums were characterized for its proximate,physicochemical, functional, rheological and thermal properties. The Acacia catechu gum wasmodified by using cold plasma treatment with different time-power combinations.Modification of Acacia gum using cold plasma treatment results in no significant changes inproximate composition of gum. However, loss of water in all samples might have taken placedue to vacuum system which removes the surface moisture. However, significant differences arefound in physical properties such as bulk density, tapped density, porosity, angle of repose,hausners ratio, compressibility index etc. indicates increase in surface roughness as well assurface area to volume ratio of gum after plasma treatment. Cold plasma treatment improveswater holding capacity and oil holding capacity compared to the untreated Acacia gum whichmight be due to increase in surface area. Plasma treatment results in decrease in pH which mightbe due to reaction of chemical species with surface moisture resulted in formation of acids. Thereis an increase in antioxidant activity after cold plasma treatment which might be due toimmanent species of plasma releases the bounded phenolic compounds as plasma reaches thegranular interior located closely to the surface which are released during extraction process. Achange in optical rotation of Acacia gum after cold plasma treatment confirms changes inmolecular confirmation. Plasma treatment also results in increasing viscosity at specific powerand exposure time compared to untreated gum. Increase in thermal stability of Acacia gum wasalso observed after plasma treatment as confirmed by TGA. There was an increase in viscosity aswell as storage (i.e elasticity) and bulk modulus (viscosity) after cold plasma treatment comparedto the untreated Acacia gum.Significant changes were found in emulsion capacity after plasma treatment. Differences werefound in emulsion stability of oil/water emulsions prepared by untreated and cold plasma treatedAcacia gum under different conditions such as sucrose, salt and at different pH values. Plasmatreated gum samples gave better coating properties than untreated samples for Jamun fruits. Theplasma treated gum coated Jamun showed reduced rate of respiration which can be correlatedwith a delayed senescence and a reduced susceptibility to decay. Therefore, plasma treatment caneffectively be used to modify the physico-chemical properties of gums and is a safe physicochemicalmethod for the modification of gums.Keywords: Acacia catechu, cold plasma treatment, modification of gums

Research Scholar: KakoliPegu

Research Supervisor: Dr. S.S. Shalini

Effect of processing on bioactive compounds of fruit and vegetable leathers

Fruit and vegetable leather is a dehydrated confectionery product, prepared from fruit pulp into thin layer sheet about 2-3mm thickness. The present study is focused on optimization of Syzygiumcumini L. fruit leather and mixed (Pumpkin, tomato and strawberry leather) using D-optimal mixture design. Optimization of formulation and process parameters was done by Design Expert 7.0. Shelf life study was also carried out for the optimized leathers. Comparison on the nutritive and bioactive compounds of both the optimized leather was carried out by three different dryers (IR dryer, tray dyer and solar dryer). The optimized leathers have bioactive compounds and are acceptable. Thus, leather from Syzygiumcumini L. fruit and MFVL will be an alternative for unhealthy candies made from sugar syrup, artificial colorant and flavor. Optimized formulation of Syzygiumcumini L. leather is 85% Syzygiumcumini L., 5.697% maltodextrin and 9.303% sugar. And that of MFVL optimum composition was selected to be: tomato 40%, pumpkin 43%, strawberry 9%, maltodextrin 5% and sugar 3%. The microbial load was less than 20 cfu g-1 throughout the storage

Research Scholar: Kakoli Pegu

Research Supervisor: Dr. S.S. Shalini

Research Scholar: Shubham Goyal

Research Supervisor: Dr. S.S. Shalini

ENCAPSULATION OF MOMORDICA CHARANTIA LINN. (BITTER GOURD) JUICE BY SPRAY DYING TECHNIQUE

India is the second largest producer of fruits and vegetables producing varieties of fruits and vegetables through-out the year and the diversity is due to different climatic conditions and diversified geographical location. India is one of the largest producer and exporter of the bitter gourd. Bitter gourd is a medicinal plant and possess many health benefits. Momordicacharantia Linn. (Bitter Gourd) is an herbal climber grown in tropical and subtropical regions, belonging to the Cucurbitaceae family. It has been used in various Asian traditional medicines for the treatment of cholera, bronchitis, anemia, blood diseases, ulcer, diarrhea, dysentery, gonorrhea rheumatism, gout, worms, colic, disease of liver and spleen, cancer and diabetes etc. The main constituents of bitter gourd are triterpene, protein, steroid, alkaloid, inorganic, lipid, and phenolic compounds, which are responsible for biological and pharmacological activities including anti-diabetic, anti-cancerous and anti-tumorous, anti-microbial, anti-viral, anti-helmintic, antimalarial, anti-ulcerative and immune-modulatory. Combination of its Ayurveda properties i.e. Gunna, Rasa and Virya (Dry, pungent, light, bitter and hot) makes it the real natures wonder. The Latin name Momordica means “to bite” (referring to the jagged edges of the leaf, which appear as if they have been bitten). All parts of the plant, including the fruit taste very bitter, as it contains a bitter compound called momordicin that is believed to have a stomachic effect. Despite of so many medicinal properties and health benefits, bitter gourd is still treated as an underutilized fruit due to its strong bitter taste. Bitter taste of the bitter gourd can be masked by the means of encapsulation of bitter gourd taste. Hence the microencapsulation of bitter gourd extract has been done by spray drying method so as to mask the bitter taste of bitter gourd. Spray drying process parameters i.e. inlet air temperature, in-feed concentration and combination of encapsulating material (maltodextrin and gum acacia) can be optimized so as to get maximum masking of bitter taste of bitter gourd, increase its shelf life and minimum degradation of bioactive compounds. Powder formulation by means of spray drying of bitter gourd extract also helped in increasing the shelf life of the bitter gourd. Thus, after obtaining the optimized spray dried bitter gourd powder, this powder can be incorporated in various food products so as to ensure the consumer acceptability of the product with providing medicinal properties of the bitter gourd at the same time. Hence the food application of the bitter gourd powder in Indian flatbread 8(Thalipeeth) was done and its market acceptability was ensured by the means of sensory evaluation.

10% turmeric powder solution treatment for 2 hour was found to be best traditional pretreatment method for de-bittering bitter gourd. Full factorial design optimization of spray drying conditions provided the optimum results at Inlet air temperature of 138 °C, In feed concentration of 26% and maltodextrin to gum acacia ratio of 54/46 with process yield of 65.99%, TPC retention of 83.68%, FRAP retention of 86.39%, TSC retention of 86.40%, Microencapsulation efficiency of 81.91% and sensory overall acceptability of 7.97. Also the 10% spray dried bitter gourd powder in Indian pan cake (thalipeeth) was found to be consumer acceptable product.

Classification: Food processing, Powder Technology, Drying

Keywords: Food processing, Spray drying, Encapsulation, Process optimization, Powder Technology, Characterization

M. Tech. (Food Biotechnology)

Research Student: Alisha Sukhija

Research Supervisor: Prof. U.S. Annapure

Studies on fermentative production of mead from honey

Mead production is of significant economic importance because of easy availability of honey. Thus, toproduce good quality meads, conditions for its optimization were studied. Mead production was doneusing three honey samples and their physicochemical analysis, total phenolics, anti-oxidant activity,sensory and volatile aspects were studied. Sensory evaluation of these three meads suggested that Forestand Lychee had better nose character as compared to Jamun mead. Gas Chromatography MassSpectroscopy supported the sensory analysis findings. Mead production was also done using differentpatterns of nutrient additions. Sensory evaluation revealed that with respect to palatability, nose,appearance and overall acceptability, the mead made with the regular nutrient addition pattern waspreferred by most of the panel members. Different yeast strains were used to ferment Lychee honey andthe organoleptic properties were studied and compared. The yeast strain KIV-1116 was successful inconverting volatile fatty acids to esters in Lychee mead but with respect to acidity, body and sweetness,EC1118 was preferred by most members. Along with this, the microbial analysis of the honey-must wasdone to standardize the methods of pasteurizing the honey before fermentation. Microbial analysisrevealed that potassium metabisulphite concentration above 40 ppm was successful in eliminating thehoney-must completely from wild yeasts. Unpasteurized honey-must was taken as a positive control andyeast growth was observed. The total yeast count in the positive control was found to be 540 ± 35.53CFU/ml. This showed that both thermal and chemical pasteurization successfully reduce the microbialload in the honey-must.

Research Student: Harsha Jagdish Bharwani
Research Supervisor: Dr. Shalini S. Arya
Influence of processing on antinutritional factors and allergens of white peas (Pisum sativum) and development of rapid immunoassay for analysing its crossreactivity against peanuts (Arachis hypogea)

Antinutritional factors are entities found in legumes which tend to affect absorption of minerals andessentials nutrients in foods. Major antinutritional factors in legumes are phytates and tannins. It isimportant for their concentration to be reduced to ensure maximum bioavailability of the nutrients forabsorption by the human body. The only way to reduce their content is through various processingmethods which would decrease them. Apart from antinutritional factors, another cause of concern are theproteins present in legumes that happen to trigger severe immune responses. Such allergy causingproteins, better known as antigens, need to be reduced as well so that unintentional ingestion does notbecome life threatening. Increase in their threshold value by reduction of allergenicity throughprocessing has proved to be helpful in a few cases.

Research Student: Mukesh Kumar Patel
Research Supervisor: Dr. Snehasis Chakraborty
FERMENTATIVE PRODUCTION OF DEXTRAN BY LEUCONOSTOC MESENTEROIDES USING PINEAPPLE WASTE

Herein, an enhanced safe and green production of dextran has been achieved by utilizing pineapple peelextract as the main media component. Different fruits and vegetable waste were screened based on ahigher yield of dextran and resulted out from screening the pineapple peel extract was found as goodfermentable media for dextran production. A study of complex interactions among sucrose concentration(2-10 %), culture volume (3-7 %), incubation temperature (25 – 37 C) and initial pH (6.5 – 7.5) wascarried out using full factorial design of experiments. The numerical optimization suggested that theoptimized composition of media having sucrose 8.08 % (w/v), inoculum size 7% (v/v), incubationtemperature 30 C and initial pH 7.0 leading to a maximum yield of dextran (15 g.L-1) after 48 hincubation. The second step involves the central composite rotatable design (CCRD) and artificial neuralnetwork- genetic algorithms (ANN-GA) were used to optimize the concentration of yeast extract,peptone, and K2HPO4 in order to maximize the dextran production from pineapple waste. The numericaloptimum operating conditions obtained by CCRD were yeast extract 11.07 g.L-1, peptone 14.9g.L-1,and K2HPO4 of 6.5 g.L-1 with an enhanced dextran yield of 24.6g.L-1. While, the optimum dextran yield (24.5 g.L-1) was predicted by ANN-GA with optimum process parameters such as peptoneconcentration (14.539g.L-1), yeast extract (10.879 g.L-1) and (K2HPO4 7.316 g.L-1). The optimizedfermentation condition will help to establish the commercial production of food grade dextran frompineapple waste as part of a novel cost-effective and environment-friendly approach

Research Student: Nitin Sukhdev Sangle
Research Supervisor: Dr. Jyoti Gokhale
Development Of Functional Food Product Using Fermented Sangri Seed Flour

The use of legume flours to supplement a food like cookie has immense potential, particularly indeveloping countries to increase the dietary intake of high quality protein. The study aimed to develop afunctional cookie with fermented sangri seed flour (FSF). The solid state fermentation conditions (1-3%yeast extract) of sangri seed flour were studied upto 5 days. The minimum tannin content withmaximum free amino acids was obtained at 2.4% yeast extract fermented for 90 h. The amount offermented sangri seed flour as a replacement of refined wheat flour (RWF) was optimized further usingD-optimal mixture design. The three constituents varied in the formulations were refined wheat flour(70-90%), fermented sangri seed flour (5-25%) and partially hydrolyzed guar gum (1-5%), respectively.The responses analyzed were hardness, spread ratio, and overall acceptability of the cookie. Theoptimized proportion in mass fraction of RWF: FSF: PHGG was 87.45:8.95:3.59 having the desirabilityvalue of 0.64

Research Student: Prabhat
Research Supervisor: Prof. U.S. Annapure
Screening of prebiotics for S. boulardii and development of delivery system

Saccharomyces boulardiiis an emerging probiotic and it is proven that it has probiotic properties whichconfers benefits for host health. It is commonly used in food formulation as a drug against number ofgastrointestinal disorders. However, it is not sufficiently stable in GI system and food processing it alsolosses it adequate count in 3-5 days once the consumption is stopped. There are very few studies thatincludes the effect of prebiotic on growth ofthe probiotic yeast. In this study certain established prebiotic(Inulin, FOS) and certain emerging prebiotic (Acacia gum, Acacia niloticagum, SFG) are screenedamong which Inulin, FOS, and acacia gum has shown promising prebiotic activity for S.boulardii.Probiotic yeast was microencapsulated with primary wall material acacia along with Inulin and FOS andspray dried at two different inlet temperatures (80 ^{o}C and 125 ^{o}C). The product yield and survivability in

GI condition is highest at 125 ^{o}C. However, at 80 ^{o}C highest viable count was found and storage viabilitycount was decreased from ranging 65-75% viable count after 45 days of storage. Synbiotification oftomato juice was also done with free yeast and encapsulated yeast. Adequate viable count was observedduring the fermentation in both cases changes in biochemical and functional properties was evaluatedvery few changes in both the properties was observed.

Research Student: Sana Jameel Shaikh
Research Supervisor: Dr. Laxmi Ananthanarayan
Development of Idli Premix for accelerated fermentation

Idli is one of the most important traditional foods of India based on cereal-legume (rice-blackgram)fermentation. It is a leavened, soft and spongy textured food item consumed mostly in southern as wellas other parts of India. Convenience food has become the need of the hour, and numerous brands ofinstant idli mixes are available in market but they are chemically leavened and lacking in the authenticflavor/aroma and nutritional characteristics of freshly prepare idli. Hence, the present study focused onthe development of an idli premix which can demonstrate on reconstitution an accelerated fermentationprocess thereby reducing fermentation time and retaining the authenticity. A number of fermented idlibatters too are available in the market but they have a very short shelf-life due to high moisture contentand live microflora and require refrigerated storage. In the present study experimental variants of idli

premix were formulated and studied to achieve a reduction in the fermentation time. Two of thesevariants, one containing added starter cultures of LAB and yeast and other containing 30% dry backslopscored good as compared to market sample of instant idli mix and idlis prepared from 12hconventionally fermented batter. Both the developed premixes were able to ferment within few hours ofmixing with water and 2% salt on dry basis (w/w of the premix). The developed premixes had a shelf lifegreater than that of RTC idli batters available in the market.

Research Student: Shaik Lubna Begum
Research Supervisor: Prof. S. S. Lele
STUDIES ON FRUIT WINES

Many wineries are confined to using grapes as substrate, as a result of which other sugar rich fruits,especially those grown in tropical zone remain underutilized. Wines from fruits like strawberry andpomegranate juice was prepared by fermenting with wine yeast (Saccharomyces cerevisiae) as starterculture. Fruits were washed, cut into the small pieces and treated with enzymes. Enzyme treatment wasdone using discrete and combination of two enzymes (0.1% Cellulase and 0.1% Pectinase). Treatmentwith combination of both the enzymes gave highest yield of fruit juice (71%). Brix was adjusted to 20Brix. Fermentation was carried out at 25° ± 1° C for 10 days in specially designed fermentationassembly. The fermentation process was observed on the basis of total soluble solids (°brix). The beststrawberry wine was obtained with 1:1 diluted ratio of juice and water with 10% v/v alcohol, pH 3.5, TA6 g/L, VA 0.8 g/L and reducing sugars of 0.1%. Pomegranate wine was obtained with 1:1 diluted ratio ofarils and water with 10% v/v alcohol, pH 3.6, TA 6 g/L and reducing sugars of 0.1%. It is concludedthat, in both strawberry and pomegranate wines, 1:1 diluted ratio of juice/arils and water was acceptablewith respect to sensory and aroma parameters.

Research Student: Shraddha Srinivasan
Research Supervisor: Prof. Rekha Satishchandra Singhal
Influence of dietary factors on hangover

Hangover is a group of unpleasant signs and symptoms such as severe headache and other after affectsthat develop upon consumption of too much of alcohol. It hampers the daily routine and poses asignificant hindrance to the development of the country. In order to alleviate the condition, steps havebeen taken to address the issue by studying the mechanisms involved. One such pathway studied is theoxidative metabolism by hepatic enzymes, alcohol dehydrogenase (ADH) and aldehyde dehydrogenase(ALDH). The influence of diet on hangover is a field that has been explored for its several advantages.Different categories of foods were analysed to study their effect on the activity of ADH and ALDH.Furthermore, the correlation between the enzyme activity and antioxidant properties of the foodcommodities were also studied. It was observed that certain commodities enhanced the activity of ADHas well as ALDH. Among the fruits, pear and sweet lime enhanced the ADH activity by 22.11 and 29.64percent, respectively, and ALDH by 90.98 and 33.47 percent, respectively. Among the vegetables,tomatoes enhanced the ADH and ALDH activity by 57.25 and 41.19 percent, respectively. Cheese andcoconut water also enhanced the activity of ADH and ALDH. The effect of selected food commodities

on the kinetics of ADH and ALDH were also determined. Based on the results obtained, a suitable antihangoverproduct based on locally available raw materials was developed which was organolepticallyacceptable, cost effective, and further validated by its effect on ADH and ALDH.

Research Student: Shubham Bharat Gaikwad
Research Supervisor: Dr. Shalini S. Arya
BIOACTIVE PEPTIDES FROM FISH WASTE

India ranks second in the harvesting and production of fishes. Therefore there is huge amount of fishwaste is being generated. This has led to the need in utilization of fish waste. In recent years, majorresearch on utilization of fish waste and production of bioactive fish protein hydrolysates from fish wastehas been carried out. The discard of fish is near about 20-40% of total fish weight. Studies onoptimization of experimental conditions and production of protein hydrolysate from Indian mackerelwaste has not been undertaken yet. Hence, this study aimed at optimizing the production of proteinhydrolysates from fish waste. Briefly, the protein was extracted by alkali method and further hydrolysiswas carried out using alcalase enzyme. For both, (protein extraction and hydrolysis) processes; factors(temp, stirring speed, pH, time, solvent load and enzyme concentrations) were optimized using boxbehkmandesign and D-optimal design of response surface methodology respectively. A protein yield of75% was recorded to be the highest at a solvent load of 64%, at 490 rpm stirring speed and for a timeduration of 80 min. Alcalase enzyme showed the highest degree of hydrolysis i.e. 71.72%, at an enzymeto substrate concentration of 40 U/mL, at a pH of 7.7, temperature of 50°C and time of 40 min. It wasobserved that fish waste protein hydrolysates had a high antioxidant and anti-hypertensive activity

Research Student: Sumita Kumari
Research Supervisor: Dr. Laxmi Ananthanaran
Study of Cajanus cajan and Lathyrus sativus using molecular biology techniques

Cajanus cajan (tur dal) is an important perennial legume, rich in protein and amino acids like methionine,tryptophan, and lysine. It is often adulterated with Lathyrus sativus (khesari dal), an annual legumegrown both as feed and fodder. In the present study, molecular biology techniques such as DNAbarcoding and proteomics have been used for detection of adulteration of tur dal with khesari dal. FourDNA barcoding loci i.e. rbcL, ITS, psbA-trnH and matK were used for the molecular identification offour varieties of tur dal, two varieties of khesari dal, four self-made flour mixtures, and four tur dalmarket samples. Presence of khesari dal in tur dal could be successfully detected in self-made admixtures

M.TECH. (BIOPROCESS TECHNOLOGY)

Research Student: Vaibhav Arun Kalokhe
Research Supervisor: Prof. U.S. Annapure
Fermentative production of inulinase from saccharomyces boulardii

Inulinase is an enzyme that degrade the -(2,1) linkages of -fructans which is present in inulin structure.Saccharomyces cerevisiae var. boulardii is well known probiotic microorganism. The present workexplores the production of inulinase from Saccharomyces boulardii using inulin as a substrate. Chicoryroot powder was used as carbon source as it contains about 17% inulin in the dried form. The aim of thisproject is to study the production, purification and characterization of inulinase from Saccharomyces

boulardii. One factor at a time was studied to optimized physico-chemical parameters such as thesubstrate concentration, carbon & nitrogen sources, batch time, pH and temperature. Optimization ofvarious fermentation parameters enhancing enzyme production by Saccharomyces boulardii wasinvestigated by using Response Surface Methodology (RSM). Maximum activity of inulinase was obtained at 30°C, pH of 6.5. Seed age of 24 hours with 3% inoculums volume gave highest inulinase activity. Inulinase was purified using ammonium sulphate precipitation,dialysis and followed by SDS-PAGE. . The molecular weight of the enzyme was found to be in the range50-55 kD. The purified enzyme was stable over pH range 4.5 to 6.5 with optimum pH of 5.5. It wasstable over temperature range 35°C to 45°C with optimum temperature of 40°C.

Research Student: Niddhi Kulkarni
Research Supervisor: Prof. Rekha S. Singhal
Immobilization & acrylamidase enzyme using crosslinkers

Acrylamide, a group 2A carcinogen, has been reported to be mutagenic, neurotoxic and reprotoxic byWHO and is a potent environmental contaminant of major concern. Various microbes have beenreported to degrade acrylamide. Cupriavidus oxalaticus ICTDB921 is one such bacteria that producesacrylamidase having the capability to convert deleterious acrylamide into acrylic acid and ammonia. Inthis study, acrylamidase was produced via fermentation by C. oxalaticus ICTDB921 with 18-20 hincubation time at 30°C and 180 rpm. The acrylamidase was then cross-linked by glutaraldehyde afterprecipitation by 40-60% ammonium sulphate to prepare cross linked enzyme aggregates (CLEAs). Theprocess parameters for preparing acrylamidase CLEAS such as the effects of precipitants, glutaraldehydeconcentration, cross-linking time, cross-linking temperature, and pH of initial broth on the activity

recovery of acrylamidase was optimized. There was a shift of maximum sustainable temperature from70°C to 50°C after cross-linking and range of optimum pH shifted from 5.0-7.0 to 6.0-8.0. There was achange in kinetic constants of acrylamidase as Km increased by 11%, and Vmax decreased by 6%. Themorphology of the acrylamidase CLEAs was analyzed by SEM, while changes in the secondary structurewere enumerated from the specific peaks in amide region of FTIR spectra. The prepared CLEAs retained up to 25% of the initial activity at the end of 15 days. Acrylamidase-CLEAs retained around 40% of itsinitial activity after 3 cycles for both pure acrylamide and industrial waste water.

Research Student: Vasudha Borkar
Research Supervisor: Dr. Jyoti Gokhale
Production, purification and characterization of naringinase from Aspergillus niger van Tieghem

Naringinase, an enzyme complex of -L-rhamnosidase and -D-glucosidase, has attracted greatly in recent years due to its hydrolytic activity on naringin. Naringin present in citrus fruits and their peels attributesbitterness to juices which reduce the palatability in consumers. The property of naringinase to hydrolysenatural glycosides has various applications in debitteration of juices, enhancement of wine aroma andalso have application in biotransformation of clinically important steroids. Aspergillus niger van

Tieghem with suitable medium components was fermented to produce naringinase in shake flasks. Citrussolid waste is used as inducer to reduce production cost as it replace naringin as an inducer. To achievemaximum yield of naringinase, fermentation parameters such as inducer concentration, carbon source,temperature, pH, fermentation time have been examined. Naringinase extracted from fermented broth ofAspergillus niger van Tieghem was purified and characterized by ultrafiltration, ammonium sulphateprecipitation, ion exchange chromatography and SDS-PAGE. Optimum temperature and pH for enzymestability were determined.

Research Student: Shyam Mewada
Research Supervisor: Dr. Shalini S. Arya
Novel, Functional Fermented Probiotic Beverage from Beetroot-Tomato Blend

The aim of the present study was to develop a functional beverage using an appropriate blend of beetrootand tomato. Based on the maximum sensory score; 80:20 ratios of beetroot and tomato juice wasoptimized and was evaluated for total phenolics, antioxidant activity, antibacterial activity and anticancerousactivity. The blend showed a high content of total phenolics, antioxidant activity after

fermentation of juice. Further, the concentration of Lactobacillus acidophilus (0.5%,1%, and 1.5%) andsugar (2%, 5%, and 10%) were optimized to develop and obtain probiotic functional beverage byfermenting at 37°C for 20hr. Changes in the bioactive constituents, total soluble solids, microbialpopulation, pH, and titrable acidity were recorded during the fermentation period and the anti-cancerousactivity of fermented beetroot-tomato juice and beetroot juice was found in the range of 73 to 80% cellviable in dose-dependent response. The 80:20 blend ratio of beetroot-tomato juice fermented for 20hrgave desirable results with the total viable count of more than 107 cfu.ml-1. The viable count ofLactobacillus acidophilus bacteria after storage 28 days remain 6 log CFU/ml.

M.TECH. (GREEN TECHNOLOGY)

Research Student: Ankita Soma Gawas

Research Supervisor: Dr. Jyoti Gokhale

Biosorption studies for Vanadium (V) removal using dried coconut leaves

In this present investigation, batch studies for adsorption and desorption of vanadium (V) were carriedout using abscised coconut leaves (ACL) powder. Adsorption in batch mode was optimized for variousparameters viz. pH of working solution, initial

concentration of vanadium, adsorbent dosage, contacttime and temperature. The biosorption of vanadium was found to follow pseudo-second order kinetics.The study of various isotherm models for current biosorption system revealed that the maximum

adsorption capacity of 46.95 mg/g of ACL powder was achieved by following the Langmuir isotherm. This maximum adsorption capacity was noted at pH 2 with ACL powder of particle size 0.355 mm,initial V (V) concentration of 100 mg/L and sorbent dosage 10g/l with 98% removal efficiency. Thethermodynamic study confirmed the endothermic nature of adsorption process. Desorption of vanadium(V) using disodium EDTA was performed in batch mode. 30gm/l of vanadium-adsorbed ACL powder in0.1 M disodium EDTA gave the maximum desorption at 30C. The adsorption capacity of ACL powderwas found negligibly affected till the end of 5th biosorption-desorption cycle. Further, the biosorptionwas carried out in continuous mode using fixed bed column. Maximum removal of 89.21% vanadiumion was achieved with 20 cm bed height, flow rate of 3ml/min and inlet vanadium concentration of 100mg/L was achieved in continuous study.

SEMINAR/CONFERENCE/WORKSHOP ATTENDED BY RESEARCH STUDENTS

1. Students of Food Engineering and Technology Department attented “International Union of Food Science and Technology (IUFoST)”, a five day event held at Mumbai from October 23-27, 2018 and the theme for this event was “25 billion meals a day by 2025 with healthy, nutritious, safe and diverse foods”.
2. Fermentative production, downstream processing and applications of acrylamidase, Dattatray K. Bedade and Rekha S. Singhal, Biopro-World Talent campus, 2018, August 16-23, 2018, Copenhagen, Denmark.

ACADEMIC PERFORMANCE AWARDS

- ICT Golden Jubilee Innovative Ph.D. Thesis Award to Dr. Nirali Shah (Rs.1,000/-)
- The Association of Food Scientist and Technologist (I) Mumbai Chapter Award to Mr. Pranav Raval (Rs. 400/-) First Rank in B. Tech. (Foods) (Sem VIII).
- Professor P.J. Dubash Memorial – AFST (I) Mumbai Chapter Award to the B. Tech. Food and Engineering and Technology Department for securing Highest marks in the subject of Food Chemistry (Theory) (Rs. 2,000/-) to Mr. Rahul Venkatram 94/100 Sem (V).
- Dr. S. R. Purao Endowment Prize to Mr. Somnath Basak T.Y. B.Tech 9.81(Rs.2000/-)
- B. Tech. Merit Prizes (ICT Students’ Fund) toMr. Yash ShahS.Y.B. Tech. 9.39 (Rs.1,000/-)
- B. Tech. Merit Prizes (ICT Students’ Fund) to Mr. Somnath Basak, T.Y.B. Tech 9.81 (Rs.2,000/-)
- The Association of Food Scientist and Technologist (I) Mumbai Chapter Award to Mr. Somnath Basak for first rank in S.Y.B. Tech. (Foods), Sem-IV, 2017.
- CT (Mr. V. B. Chitale Award), for First Rank In FETD course to Mr. Somnath Basak, T.Y.B. Tech. (Foods).
- ICT (Mr. B. A. Parvatilar Award), for First Rank In FETD course to Mr. Yash Shah, S.Y.B. Tech. (Foods).

COCURRICULAR AND EXTRACURRICULAR AWARDS

Sr. No.	Name of Student	Class	Event	Activity	Prize
1.	Dattatray Bedade	Ph.D	Vortex 2018	Oral presentation	2nd Prize
2.	Shreya Madhav	T.Y.B.Tech.	Vortex 2018	Manifesto	1st Prize
	Jaishree Kumbhare		Vortex 2018		
3.	Pritam Patil	S.Y.B.Tech	Vortex 2018	Chemwars	1st Prize
4.	Sandeep S.Suryawanshi	Final.Y.B.Tech	FUNTECH-2019	Badminton	Runner-up
5.	Abhijeet B. Muley	Ph. D.	BEST ABLE 2019 (Held at Bangalore)	Entrepreneurship competition	3rd Prize
6.	Sandesh Marathe	Ph. D.	IUFoST 2018	Poster presentation	Best Poster
7.	Amruta Bawane	Ph. D.	IFCON	Oral presentation	1st Prize
8.	Shweta Deshaware	Ph. D.	IFCON	Oral presentation	1st Prize
9.	Abhijeet B. Muley	Ph. D.	BIO SD 2018	Oral Presentation	Oral talk
10.	Seema R. Bajaj	Ph. D.	TIIFH 2019	Oral presentation	Lead lectures

11.	Prasanna P. Bhalerao	Ph. D.	TIIFH 2019	Oral presentation	Lead lectures
12.	Abhijeet B. Muley	Ph.D	ICL 2018	Cricket	Winners
	Manoj J. Dev				
13.	Amruta Bawane	Ph. D.	UGC-CAS In-house seminar	Oral presentation	1st Prize
14.	Madhura Janve	Ph. D.	UGC-CAS In-house seminar	Oral presentation	2nd Prize
15.	Gayatri Bakshi	Ph. D.	UGC-CAS In-house seminar	Oral presentation	3rd Prize
16.	Abhijeet B. Muley	Ph. D.	UGC-CAS In-house seminar	Poster presentation	1st Prize
17.	Santosh D. Pradhan	Ph. D.	UGC-CAS In-house seminar	Poster presentation	2nd Prize
18.	Saee Nikam	M. Tech	UGC-CAS In-house seminar	Poster presentation	3rd Prize
19.	Kakoli Pegu (Captain, Team ICT)	Ph.D.	SPORTSAGA 2K19	Cricket	Runner-up
	*Anusha Mishra	Ph.D			
	*Shilpa Jana	Ph.D			
20.	*Kakoli Pegu (Captain, Team Hostel-2)	Ph.D.	Funtech 2K19	Cricket	Winners
	*Anusha Mishra				
	*Shilpa Jana				
	*Sneha Kamble	M.Tech			
21.	Rupali Katekhaye	M. Tech	SPORTSAGA 2019	Kabaddi	Runner-up
	Saniya				
22.	Kavya Sood	M. Tech	UGC-CAS In-house product development	Product Development	Winners
	Nissy Mary Prasad	M. Tech			
	Pratipanna Dash	Ph. D.			
	Onkar Erande	B. Tech.			
23.	Shreyasi Phatak	M. Tech	UGC-CAS In-house product development	Product Development	Runner-up
	Mihir Desai	Ph. D.			
	Chirag Anandi	M. Tech			
	Deepak Gujar	M. Tech			
24.	Varad Bende	M. Tech	Bioconclave		
25.	Kakoli Pegu	Ph.D.	Yuvam 2019	Group Dance	first
				Cricket	Winners

(* Indicates woman student)

BATCH OF 2019

- Protein Foods & Nutrition Development Association of India's (PFNDAI) Merit-cum-Means Scholarships for students of Food Science/Technology & Nutrition, Onkar Erande and Ankit Dhelriya(Final Y.B.Tech.-Food) (Rs.15000/- + Certificate)
- Indian speciality chemical manufacturer's association (ISCMA) achievements Awards, Ankit Dhelriya(Final Y.B.Tech.-Food)-(Rs.5000/- + Certificate)

BATCH OF 2020

- Indian speciality chemical manufacturer's association (ISCMA) achievements Awards, Akshaykumar Koradiya (T.Y.B.Tech.-Food) – (Rs.5000/- + Certificate)

BATCH OF 2021

- Indian speciality chemical manufacturer's association (ISCMA) achievements Awards, Ghananil Sarode (S.Y.B.Tech.-Food) - (Rs.5000/- + Certificate)

PLACEMENTS

The FETD actively attempts to place the graduates in various national and multinational industries in the field of food and biotechnology. Various companies visit the campus to select best of the students.

PLACEMENT OF B.TECH. (FOOD ENGINEERING & TECHNOLOGY)

	Graduates Employed		Higher Studies	
Year	Passed	Industry	India	Abroad
2015	16	4	1	6
2016	16	4	3	6
2017	16	7	01	04
2018	14	6	01	02
2019	16		03	04

PLACEMENT OF M. TECH. (FOOD ENGINEERING & TECHNOLOGY)/M.TECH (FOOD BIOTECHNOLOGY)

	Masters Employed		Higher Studies	
Year	Passed	Industry	India	Abroad
2015	21	06	-	-
2016	22	14	-	-
2017	22	11	-	-
2018	22	07	1	-
2019	24			

PLACEMENT OF Ph.D. (TECHNOLOGY / SCIENCE)

	Doctorates Employed		Higher Studies	
Year	Passed	Industry	Academics	Abroad
2015	8	4	3	1
2016	12	5	3	-
2017	3	-	-	-
2018	9	-	-	-
2019	14	4	2	1

CAMPUS PLACEMENTS 2017-18

Sr.	Company	Student	Degree
1.	Danone , Punjab	Pranav Raval	B.Tech
2.		Rohit Jorigal	
3.	Pepsico	Noopur Mehta	B.Tech
4.	Mondelez india foods pvt. Ltd. Thane	Alisha Sukhija	M.Tech.
5.	Evalueserve, Gurgaon	Prabhat Chauhan	M.Tech.
6.		Kapil Rai	
7.		Yash Kakani	B.Tech
8.	Godrej, Vikhroli	Shubham Purandare	B.Tech
9.	Marico	Vaishnvi Patki	B.Tech
10.	ITC	Sneha Awasti	M.Tech.
11.		Harshal	
12.	Spinco Biotech Pvt Ltd, Navi Mumbai	Nitin sangle	M.Tech.

CAMPUS PLACEMENTS 2018-19

Sr.	Company	Student	Degree
1.	Mapro foods, Wai	Roshan Joseph	B.Tech.
2.		Sandeep Suryawanshi	
3.		Madan Dhulgande	M.Tech.
4.	Mondelez india foods pvt. Ltd. Thane	Bisal prasher	M.Tech.
5.	ITC	Somnath Basak	B.Tech.
6.		Claudia Samual	
7.	Kay Bee Exports	Shreyasi Phatak	M.Tech.
8.	Tata Chemicals, Nellore, Andhrapradesh	Ankit Dhelriya	B.Tech.
9.		Ankita Wadhe	
10.		Krupa Dhurve	
11.	CavinKare, Bhiwandi	Prateek katariya	M.Tech.
12.	Freshtrop, Nashik	Sagar Mahale	M.Tech.
13.	Evalueserve	Oindrila Ghosh	M.Tech.
14.		Naveen Sakhya	
15.	ITC, Banglore	Omkar sawant	M.Tech.

SUMMER PLACEMENT

Sr.	Student	Class	Place/Project	Period (May 15, 2018 to June 30, 2018)
1.	Sudhanwa Lele	S.Y.B.Tech.(FET)	Limonene extraction from Lemon Peels	45 days
2.	Rajeev Ramesh	S.Y.B.Tech.(FET)	Omega 3 fatty acid enriched chocolate	45 days
3.	Rahul Kamath	S.Y.B.Tech.(FET)	Development of coconut milk beverage	45 days
4.	Yash Vijaykar	S.Y.B.Tech.(FET)	Plant based meat	45 days
5.	Aashita Pillai	S.Y.B.Tech.(FET)	Plant based meat	45 days
6.	Hrithik Shetty	S.Y.B.Tech.(FET)	Use of natural pigments in baked foods	45 days
7.	Srushti Sindagi	S.Y.B.Chem.Engg	Making of biscuit stuffing by using coffee left over	45 days

CO-CURRICULAR EVENTS AND PERSONNEL TRAINING

PERSONNEL TRAINED

Students from various institutes visited the FET Department. A Departmental tour to various labs was organized by our faculty. Food processing equipments and other facilities were shown to them. The details of the institutes and number of students who visited the Department are given below.

Sr. No.	Name of the institute	Date of Visit	Background of the students	No. of students
1.	Keral Agricultural University, Kerala	28/02/2019	T.Y.B.Tech (Food Engg. & Tech.)	47
2.	AES School, Wadala	01/03/2019	8th Std.	60
3.	K.K.Wagh College of Food Technology, Nashik	11/06/2019	T.Y.B.Tech	50

DASSARA PUJA 2018

We celebrated 'Dassara' in our department with grandeur and pomp.Colourful rangolis made by all the lab members adorned the labs. Like every year, the dasara pooja was performed in the processing lab of Food Engineering and Technology Department to seek the blessings of the deity. All the students were dressed in traditional attires representing the colourful and unique culture of India. The function began at 10 am on October 17, 2018 with inauguration of renovated food analysis lab in hand with invited guest Dr. Chadda, UAA president and Past out student of FETD Batch 1965. Prof G.D.Yadav Vice Chancellor, ICT and faculty of FETD lighting the lamp. After that aarti and floral offerings to goddess Saraswati. All the faculty members, non teaching staff and students of FETD got together for the puja, aarti. The auspicious occasion concluded with hearts filled with happiness and peace.






NATIONAL NUTRITION WEEK - 2018

Every year Food Engineering and Technology Department of ICT Mumbai in association with AFSTI celebrates Nutrition Week. On this occasion, FETD ICT hosts a range of inter collegiate competitions like debate, poster paintings, skit and recipe in the morning session and latter talks by eminent scientists for creating awareness and interest in the field of Food Science and Nutrition.

This year Nutrition week was celebrated on 7th September, 2018from 9am to 5pmat K.V. Auditorium, ICT, Mumbai.

Registration started at 9 am on 7th September,2018.There were approx. 180 students from different colleges altogether who have registered for nutrition week celebration at ICT Mumbai.M.Tech first year students of ICT have coordinated with participants and got them registered for the event.

Around 45 students from different colleges have participated in debate competition which was evaluated by Dr. SnehasisChakraborthy and Ms. ShubhapradhaNishtala and coordinated by Ms. Aratrika and Anusha Mishra

The main theme of the debate competition was Fast Foods vs Traditional Foods.

Around 43 recipes where presented by students from different colleges. The theme of the competition was Low Fat or Fat Free recipe. Participants were asked to show how process, science and technology can help to prepare low fat or fat free recipes from conventionally high fat products. This competition was judged by Dr. Laxmi Ananthnarayan and Ms. Rosy Waghmare and coordinated by Shaik Lubna.

Around 70 students have participated in poster competition. Participants were asked to prepare poster on the spot. Theme given was “Eat Right”. Dr. Warrier and Prof Rekha Singhal were the judges of the competition and coordinated by Ms. Prajakta Sadawarte, KakoliPegu and Pavan Kumar More.

Around 8 groups from different colleges have registered for skit competition. Theme of the competition was “Food habits of young urban India”. The judges were Dr. Jayant Bandekar and Dr. Shalini Arya.

Everyone gathered in K.V Auditorium, ICT Mumbai to listen lectures by Chief guests. Firstly, Dr. Shalini Arya welcomed all dignitaries on to the dias and presented themwith bouquets.

Dr. H.A.B Parpia Lecture

Dr. H.A.B Parpia lecture was delivered by Dr. D. N Kulkarni from Jain Irrigation. He mainly focused on “What will make food industry shining”. Main highlights of the lecture were Smart farming, Safe and sustainable GAP, first 1000 days of life, Food habits-how to change?

GCP Rangarao Memorial Lecture

GCP Rangarao Memorial lecture was delivered by Dr. Laxmi Ananthnarayan, Associate Professor, ICT Mumbai. Her lecture mainly focused on “Emerging food packaging techniques for food preservation”

World Food Day 2018 (Date 16 october 2018)

- **2018 biennial conference of the international network for Government science advise (INGSA) in Tokyo, Japan**

On 6 and 7 November 2018, Dr. Arya Shalini attended the 2018 biennial conference of the international network for Government science advise (INGSA) in Tokyo, Japan. The conference theme was science advice for a changing world and explored the principles, practices, and dynamics of working at the science-policy interface, particularly in relation to achieving the United Nations (UN) Sustainable Development Goals (SDGs). Emerging technologies, artificial intelligence(AI), science diplomacy, and the future of science advice were high on the list of discussed topics.

The meeting started strongly with a keynote by helen clark, former new zealand prime minister, who stated that, ‘in a post –truth world science and science advice will be challenged so we must be ready’, and in discussion with peter gluckman, she addressed the glaring lack of science advice at the highest level of the UN. In another keynote, vladimir sucha showed one of the most captivating slides of the conference: ‘Facts vs citizens estimations in relation to the percentage of migration in their countries’ which showed a 14 fold difference (14X) between reality and citizens perceptions with regards to the number of migrants in their country.

Dr. Arya who is also a GYA member took the stage to chair session, and summarize the results of the day. GYA Co-Chair Connie Nshereirwe and member Akihiro Kishimura (Japan) gave the conferences closing remarks. Connies words resonated in all of us: ‘As scientists, we have a responsibility to engage and lead in science advice, even if we get no reward or recognition by our institutions’.

Prior to the main INGSA conference the GYA, in partnership with the Youn g Academy of Japan and INGSA, organised a one day science leadership training workshop. Attended by about 40 young scientists and policymakers, the aim of the workshop was two-fold: to introduce participants to the use of scientific evidence in informing policy at all levels of government; and to develop a personal strategy for their engagement with the science advice enterprise.

It was great to see that the number of scientists interested in science advice is increasing, that young policy markers of japan actively participated in the workshop and listened to what young scientists had to say, and that we are helping prepare them all for important roles at the interface of science and policy marking.

Dr. arya also participated in many satelite events, such as a Science Diplomacy Workshop, a Science in the Global South meeting, a Cities and Urban Science Advice Workshop, and a Parlimentary Advice Workshop.

- **One-Day-In-House Seminar on Uprising Drift in the Path of Food Biotechnology and Fermentation Technology Dec-2018**

Department of food engineering and technology is organizing One-Day-In-HouseSeminar on Uprising Drift in the Path of Food Biotechnology and Fermentation Technology on 26th December 2018 at ICT Mumbai. This seminar is organized under UGC-CAS II activity. The seminar is totally dedicated to research students of FETD. There will be both oral and poster presentation from our In-house research students.

- **Hands on Training on Food bioactives on 5-7 feb 2019**

- In house food product development Competition feb-2019
- Keva Flavours Food product competition April 12, 2019

ACKNOWLEDGEMENT

We thankfully acknowledge the following Industries and Institutes for accommodating our Food Engineering and Technology students for summer training.

IN-PLANT TRAINING: T. Y .B. TECH (FOOD ENGG. & TECH.) MAY-AUGUST 2019

Sr.	Name	Project Name	Company For IPT	Place
1.	Akshay koradiya	Overview of production and quality control	Modern Foods Enterprises Pvt. Ltd.	Mumbai
2.	Anuj jaju	Product development: high potein bars	Wholesome Habits	Mumbai
3.	Jaishree khumbare	Development of gluten-free, high protein baked snacks and fat-free Caesar dip	DKSH Holdings Pvt. Ltd.	Mumbai
4.	Nikita bhatkar	Study on texture of ot porridge	Marico limited	Mumbai
5.	Rahul chaudhary	Overview of production, QC2A	VKL Flavors Pvt. Ltd.	Navi Mumbai
6.	Rahul venkatram	Quantification and minimization of variability in bars	ITC Limited Foods Division	Bangalore
7.	Rakshita Prasad	Formulation of bake stable sauce	General Mills	Mumbai
8.	Sanket vanare	Product development of fruit-enhancing flavour mixes	Mapro Foods Pvt Ltd	Satara
9.	Shreya naguri	Mathematical modelling of water activity of cakes	General Mills	Mumbai
10.	Shrikesh narule	Overview of flavour encapsulation	VKL Flavors Pvt. Ltd.	Navi Mumbai
11.	Saurabh joshi	Product development of high protein, gluten free vegan cookies	Kaarya naturals pvt. Ltd	Mumbai
12.	Sudarshan patil	Quality control of physiological properties of manufacturing tines and product	Freshtrop Fruits Ltd.	Nashik
13.	Vimi kuwlekar	Overview of quality control department	Freshtrop Fruits Ltd.	Nashik
14.	Yash shah	Texture, quantification og yippee noodles	ITC Limited Foods Division	Pune

IN-PLANT TRAINING: M. TECH (FOOD ENGG. & TECH.) MAY-AUGUST 2019

Sr.	Student Name	Course	Industry	Project Name
1.	Akash kshirsagar	FET	Equinox Labs, Navi Mumbai	Analytical Testing of Food and Water samples
2.	Anjali barela	FET	Innovertus Nutrition Technologies, Pune	High Protein Bar
3.	Annapoorna R.P.	FET	Bauli India Bakes and Sweets, Pune	Comparative evaluation of chocolate cream with different starches
4.	Ashutosh rai	FET	Fizzy Foodlabs, Mumbai	R&D Commercialisation
5.	Bharati bhagat	FET	Mondelez India, Mumbai	NPD for cocoa beverages, quality improvement and safety of product, HACCP
6.	Datla Nishita	FET	Mondelez India, Mumbai	Compliance trainee in Scientific Affairs & Regulatory Affairs
7.	Johnsy K J	FET	Innovertus Nutrition Technologies, Mumbai	Caffeine emulsions for soft gels
8.	Mohit Kumar	FET	Mondelez India, Mumbai	Quality Improvement and Food safety in refreshment beverages
9.	Muhammad Salman Chukkan	FET	Mondelez India, Mumbai	NPD for refreshment beverages, Process Optimisation for Cocoa beverages
10.	Nachal N	FET	ITC Ltd., Bengaluru	Development of Gluten free flour
11.	Nishank Waghmare	FET	Vista Foods, Mumbai	Improvement in process and quality of paneer; Design of paneer cutter
12.	Nissy Mary Prasad	FET	Jus Amazin Foods, Bengaluru	NPD and Production
13.	Rupali Katekhaye	FET	CPKelco, Mumbai	Role of hydrocolloids in juices, dairy and confectionery products
14.	Shubham Mishra	FET	Wrigleys India, Baddi, HP	Quality Assurance and Production Troubleshooting
15.	Sukitha A	FET	GO DESi, Bengaluru	NPD, Quality and Shelf life studies, HACCP
16.	Taniya Jha	FET	ITC Ltd., Bengaluru	Development of healthy extruded snacks
17.	Vigneshwaran G	FET	Equinox Labs, Navi Mumbai	Compliance trainee in Food Safety & Regulatory Affairs

18.	Kavya Sood	FET	Mondelez India, Mumbai	Chocolate Innovation(NPD) for Asia, Pacific ,Middle East and Africa, and Australia New Zealand regions (AMEA)
19.	Aayushi Pal	FBT	Merino India, New Delhi	Quality control of RM and FG
20.	Chirag Anandi	FBT	Equinox Labs, Navi Mumbai	Microbiological analysis of Food Samples
21.	Logesh V N	FBT	Equinox Labs, Navi Mumbai	Compliance trainee in Scientific Affairs & Regulatory Affairs
22.	Mohammad Shahrukh	FBT	Tata chemicals, Pune	Sugar replacement in sesame halva and kajukatli using FOS
23.	Mona Kokwar	FBT	Equinox Labs, Navi Mumbai	Quality Assurance and FSSAI Compliance
24.	Seshadrinathan Shruthy	FBT	Novozymes, Bengaluru	Palm oil application and development using enzymes.
25.	Srutee Rout	FBT	Himedia, Mumbai	Isolation of mesenchymal stem cells from goat
26.	Varad Bende	FBT	ITC, Bengaluru	Optimization of dosage of millets in instant fried noodles
27.	Zumismita Kalita	FBT	Tata chemicals, Pune	Shelf life extension of spice mixes

We would also like to thank the following persons/organizations for their generous support through donation to the FETD.

DONATIONS

Sr.	Person/Company	Amount (Rs.)
1	VAL Organic Pvt. Ltd	600000/-
2	Scholarship & research fund	30000/-
3.	Dr. Sudhir Mistry	100000/-

MAJOR GRANTS RECEIVED IN THE LAST FIVE YEARS

Sr.	Sponsoring Agency	Amount / Year	Title
1.	DST-SERB	Rs.48 lakhs April 2017-March 2020	Pulse light processing of beverage using under-utilized fruits: value addition, process optimization & shelf life extension
2.	Rajiv Gandhi Science and Technology Commision (RGC)	Rs.67.27 lakhs 2014-2017	Exotic tropical fruit wines-microbrewery demo plant
3.	DST Govt. of India	Rs.130 lakhs 2013-2016	Holistic approach for commercial processing of fruits and vegetables grown in western Maharashtra
4.	UGC	Rs.200 lakhs 2018-2023	UGC CAS Phase – II

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