

**CENTER FOR ADVANCED FACULTY TRAINING IN HOME SCIENCE
XXVII TRAINING PROGRAMME ON**

***“Advances in Food Processing Technologies for Value Addition & Enterprise
Development”***

From 21st January to 10th February 2015

Training Report



ORGANISED BY

Dr. Mahalakshmi V. Reddy
CAFT Director

Dr. K. Uma Maheswari
Course Director

Co – Coordinators

Dr. K. Aparna

Dr. Jessie Suneetha W



Center for Advanced Faculty Training in Home Science
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ACKNOWLEDGEMENT

The CAFT Director, Course Director and Course Co-Directors gratefully acknowledge the financial support provided by the Indian Council for Agricultural Research (ICAR) for conducting the 21 days training program entitled “Advances in Food Processing Technologies for Value Addition and Enterprise Development” held from 21st January to 10th February 2015, under Center for Advanced Faculty Training in Home Science. Our special thanks to Dr.V. Praveen Rao, Registrar cum Special Officer of the Professor Jayashankar Telangana State Agricultural University (PJTSAU), the newly created university after Telangana State Division for fully extending cooperation to conduct CAFT – H.Sc activities under the Faculty of Home Science. We express our sincere thanks to Dr. Anurag Chaturvedi, Associate Dean & In charge of Dean of Home Science for providing total support and valuable contributions to the training. We express our sincere thanks to Keynote speakers Dr.A Satyanarayana, Head CFTRI, Resource Center Hyderabad, Dr.D.Rama Rao, Director NAARM, and other eminent speakers Dr. Raji Reddy, Director of Research, PJTSAU and Dr.A Sharada Devi, Retd. Professor Emeritus, ICAR, during the Inaugural and Valedictory Sessions of the training.

We acknowledge the guest speakers who came from PJTSAU, ANGRAU,DOR, CFTRI - Mysore, CFTRI - Hyderabad, AIIMS - Raichur, DST - New Delhi, YSR Horticulture University, ICRISAT - Hyderabad, SEED-Hyderabad, DSR - Hyderabad, NFDB - Hyderabad, Nano Technology Lab - RARS, Tirupati, National Egg Coordination Committee, Packaging Clinic & Research Institute - Hyderabad, NIRD - Hyderabad, APEDA - Hyderabad, NECC – Hyderabad, College of Veterinary Sciences, Karimnagar. We also acknowledge the institutes which allowed for field visits to all our CAFT trainees - VSR Foods, NRC Meat - Hyderabad, ICRISAT - Hyderabad, VH Agro Foods - Hyderabad, APDDB – Hyderabad.

We thank the Director of DOR for providing comfortable lodging and boarding facilities for the participants and guest speakers. We thank the Non teaching staff of CAFT and College of Home Science for the support and help rendered all through the training period.

Dr. K Uma Maheswari
Course Director

Dr.Mahalakshmi V.Reddy
CAFT Director

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EXECUTIVE SUMMARY

By

Dr. K Uma Maheswari, Course Director

Food processing is the transformation of raw ingredients into food, or of food into other forms. Food processing typically takes clean, harvested crops or butchered animal products and uses these to produce attractive, marketable and often long shelf-life food products. The processed food industry is divided into the following broad segments:

- Primary processed food - which includes products such as fruits and vegetables, packed milk, unbranded edible oil, milled rice, flour, tea, coffee, pulses, spices, and salt, sold in packed or non-packed forms.
- Value-added processed food - which includes products such as processed fruits and vegetables, juices, jams, pickles, squashes, processed grain products like biscuits, pasta, noodles; processed dairy products (ghee, paneer, cheese, and butter), processed poultry, and processed marine products, confectionary, chocolates, and alcoholic beverages.

Across the world, food-processing is considered to be a sunrise sector because of its large potential for growth and socio economic impact. It not only leads to income generation but also helps in reduction of wastage, value addition, and foreign exchange earnings and enhancing manufacturing competitiveness. In today's global market, quality and food safety have become competitive edge for the enterprises producing foods and providing services. "With proper investment in food processing, technical innovation and infrastructure for agriculture sector, India could well become the food basket of the world". The existing level of processing and the extent of value addition are very low as compared to other developing countries.

In India the food processing industry is ranked fifth in terms of production, consumption, export and expected growth. A strong and dynamic food processing sector plays a significant role in diversification of agricultural activities, improving value addition opportunities and creating surplus for export of agro-food products. Food processing accounts for about 14% of manufacturing GDP, i.e. Rs. 2,80,000 crore, and employs about 13 million people directly and 35 million people indirectly. Its employment intensity can be seen by the fact that for every Rs. 1

million invested, 18 direct jobs and 64 indirect jobs are created in organized food processing industry only.

It is widely accepted that the food processing sector is the most appropriate sector for creating jobs for rural poor, and thus reduce the burden on agricultural sector for creation of their livelihood. This is due to their familiarity with the agricultural sector which would make it easier to train and place them in food processing enterprises. The multiplier effect of investment in food processing industry on employment generation is also higher than any other sector. Therefore, for the overall progress of economy it is important that the farmers and backward communities working in rural food-processing units are treated at the top of the growth process. Rapid and sustained poverty reduction requires economic growth which is inclusive and the one that allows people to contribute to and benefit from it.

In India, the food processing industry is highly fragmented and is dominated by the unorganized sector. A number of players in this industry are small. About 42% of the output comes from the unorganized sector, 25% from the organized sector and the rest from small players. Though the unorganized segment varies across categories but approximately 75% of the market is still in this segment. The organized sector is relatively bigger in the secondary processing segment than the primary processing segment. Increasing urbanization, consciousness on health and nutrition and changing lifestyle are changing the consumption habits of India. The number of working women, single students/professionals and nuclear families are creating demand for processed ready-to-eat foods. Growth of organized retail, which makes the processed food readily available, is also driving growth of food processing.

India is a country of over 1.21 billion consumers; 300 million upper and middle-class consume processed food. There is a large untapped domestic market of 1,000 million consumers in the food processing sector and 300 million more consumers are expected to shift to processed food by 2012. It is the second-largest producer of fruits and vegetables in the world. Further, India has tremendous potential to unleash large- scale process-based farm activities to exploit the emerging global business opportunities. This has resulted in the development of the food processing industry.

The food processing sector in the country with its vast potential has emerged as one of the major drivers of economic growth. It is encouraging to note that Economic Outlook has pegged GDP growth rate for 2011-12 at 8.2% in spite of the EU crisis and other issues being faced. The food processing industry in India is growing at 14% annum. While consumption of food gives material pleasure and a healthy life, contaminated food can be dangerous to health. Therefore, quality of food is very important. Even from the producers' point of view, selling high quality food can be viewed as a competitive strategy to overcome competition. With the recent agreement on Sanitary and Phytosanitary (SPS) measures, World Trade Organization (WTO) has made it mandatory for all member states to follow international food standards guidelines in the sphere of foreign trade. An important element of these guidelines is the compliance with Hazard Analysis and Critical Control Points (HACCP), a management system for food safety. Indian firms will have to adopt these guidelines; else they will have to face nontrade-barriers in the export market.

With this background, this training program entitled “Advances in Food processing technologies for Value addition and enterprises Development” was proposed as a 21 days training program and got sanctioned. All the agriculture universities Vice- Chancellors, Deans of Home science and Directors of Foods and Nutrition, training coordinators of at least 40 KVKs were sent the training brochure and nomination form by Post for deputation of at least two eligible faculty members for the training. Initially there was a lot of response from faculty members from all over India and they also sent advanced copy of the nomination form. University officials were further contacted by email and telephone for deputation of staff. There were 3 outstation participants who dropped out in the last moment, due to official and personal reasons. Hence the training program was offered to twenty three participants by accepting the nominations. Knowledge level of the participants regarding the training was taken-up through pre-evaluation, before the commencement of the training.

The program was inaugurated at Committee Hall, Central Library, PJTSAU, Hyderabad. The Chief Guest, Dr. A.Satyanaraya, Scientist F and Head CFTRI, Resource Center, Hyderabad, The Special Officer and Registrar Dr.V.Praveen Rao, Dr. Anurag Chaturvedi, Dean i/c and

Associate Dean of Home Science, Dr. Mahalakshmi V. Reddy, CAFT Director, Dr. K. Uma Maheswari, Course Director were on the Dias. The chief guest of the function, Dr.A.Satyanaraya, delivered the keynote address. In his address he stressed the need and importance of processing of different foods using Novel Technologies for Value addition and Enterprise Development. The participants were enlightened with the speech.

Dr. P. Nageswara Rao, Professor & Head (Rtd), Institute of Agriculture Engineering & Technology, PJTSAU, Hyderabad explained about the rice milling, the methods, types and new advances in rice milling methods and how the new methods are useful for the improvement of productivity of the rice.

Dr. Vijaya Khader, Dean (Rtd), Faculty of Home Science, ANGRAU, Hyderabad, gave a lecture on grain processing as a value added product for enterprise development. She explained about the production of grains like cereals, millets, legumes, nuts and oil seeds. The need and importance of grain processing and the major challenges faced by food processing industries in India were also explained.

Dr. Rajarami Reddy, Liasion officer, Professor Jayashankar Telangana state agricultural university, Hyderabad gave a lecture on finding Avenues for Research. The lecture focused on support including financial support for research by different Government, non government institutes, NGO's and other institutions.

Professor Vimala, Associate Dean (Rtd), College of Home Science, ANGRAU, Hyderabad, explained about the processing of sorghum as source of value addition and enterprise development, The nutritional values of sorghum and what all the reasons for which it is not been used often were also explained.

Dr. K S M S Raghava Rao, Chief Scientist, Dept of Food Engineering, CFTRI, Mysore, Explained about the role of food processing equipment for setting up small and medium entrepreneurship development and Technology transfer for enterprise development. About the New food processing operations, The transport phenomenon in food Engineering and applications of ATPE.

Dr. K Manorama, Principal Scientist & Head, Quality Control Lab, PJTSAU, Rajendra Nagar, Hyderabad. She explained about the role of Biotechnology in food processing and

enterprise development and also the Applications of Biotechnology in food processing stages and about probiotics, its applications and new advances in food processing industry.

Dr. T N V K V. Prasad, Senior Scientist, Nanotechnology Laboratory, Institute of Frontier Technology, RARS, Tirupati. Gave lecture on Introduction to Nano technology and Applications of Nano Technology and the Role of Nano technology in Nutraceuticals and functional foods.

Dr. V. Vijaya Lakshmi, Professor, CHSc, PJTSAU, Saifabad, Hyderabad, explained about the Bakery processing technologies for development of an enterprise. She explained the new trends in Bakery industry and what all the new business ventures in the industry for enterprise development.

Dr. K. Uma Maheswari, Professor & University Head (Foods & Nutrition) & Programme Director (Food Technology) Post Graduate & Research Centre, PJTSAU, Hyderabad, gave lecture on Utilization of underutilized foods for value addition

Dr. Mahalakshmi V. Reddy, Professor & Head (RMCS) & Director (CAFT), CHSc, PJTSAU, gave lecture on Development of entrepreneur skills, How the skills will help in business handling and dealt about the details of different types of skills and its advantages for an Entrepreneur.

Evaluation of the Training:

On the last day of the training, participants were provided with the post evaluation schedule, to assess the knowledge gained through the 21 days training on "Advances in Food processing technologies for Value Addition and Enterprise Development". Clearly there was substantial difference in the test scores of the participants between the pre and post evaluation. Participant feedback on the training program too was obtained and most sessions were rated as either excellent or very good. They also stated that the topics covered were very useful to all the participants. Few suggestions such as inclusion of more hands on training, more sessions on meat and dairy processing etc were suggested by few participants.

Valedictory: The training program was concluded with the valedictory function on 10th February 2015. The chief guest was Dr D. Rama Rao, Director NAAM, and Dr V Praveen Rao, Registrar & Special Officer, Prof. Jayashankar Telangana State Agricultural University. Dr.

Anurag Chaturvedi, Associate Dean and Dean i/c College of Home Science, Hyderabad presided over the function. Dr. Mahalakshmi V. Reddy, CAFT Director welcomed the gathering. Dr K.Uma Maheswari, Course Director gave a brief report on all the activities carried out during the training program. Dr. D. Rama Rao, Director NAAM, Released the CD's of 21 days training program. Dr. Anurag Chaturvedi, Associate Dean, College of Home Science, Hyderabad addressed the gathering about the importance of knowledge management in the field of Home Science. The chief guest gave a speech on Value addition and Enterprise Development essential in India. He focused on the participants stating that they are the ambassadors in their respective universities to promote this kind of trainings. After the speech, certificates were distributed by the chief guest to all the participants.

ABOUT CAFT - HOME SCIENCE TRAINING PROGRAMME - 2014-2015

“Advances in Food processing Technologies for Value addition and Enterprise Development”

21-01-2015 to 10-02-2015

Concept:

India is the third largest producer of all foods in the world and is behind only to China and USA. We produce greater than 600 million tons of foods in all. We are the largest producers of pulses, milk, tea, all spices, first or second largest producer of fruits and vegetables, largest in live stock population, third largest in grains and oil seeds, fifth largest in poultry and seventh largest in fish productions. We have greater than 7000 km of marine landing where we can fish all around the year.

In spite of these superlative productions, the food supply in domestic market place is inadequate. Indians do not get healthy foods, and our export share in international markets is much less than 2%. All these are due to lack of technical manpower in food processing sector, fewer ventures in food processing businesses, huge losses, lack of technical knowhow and so on. A dire need to avert the situation is to create new manpower in food processing technologies. We do not have sufficient manpower either to venture in new food processing businesses or to meet the current man power demands of food processing industries. We also lack in scientific manpower to work on creating new and cost effective food processing and value addition technologies. There is a tremendous scope for entrepreneurial development in the crop processing sector in view of the ever-changing lifestyles, needs and wants of the present day consumer.

Value addition and agro processing are regarded as sun rise sector of Indian economy in view of its large potential for economic growth. Importance of value addition lies in the fact that it has capability to meet food requirement of growing population by eliminating avoidable losses making more nutritive food items. Value addition refers to the techniques applied to agricultural produce after harvest for its protection, conservation, processing, packaging, distribution, marketing and utilization to meet the food and nutritional requirements of the people in relation to the needs. The training curriculum has been developed in consonance with the needs of participants in order to provide thrust to promote value addition in agricultural crops, to stimulate

agricultural production; prevent post-harvest losses, improve nutrition and add value to the products and develop enterprises.

The process of developing of value addition technology and its purposeful use needs an inter-disciplinary and multi-dimensional approach, which must include, scientific creativity, technological innovations, commercial entrepreneurship and institutions capable of inter-disciplinary research and development all of which must respond in an integrated manner to the developmental needs.

Objectives:

- To familiarize with emerging concepts in value-added agriculture and crop processing technologies.
- To understand the scope of value added products for enterprise developments.
- To gain hands on experience in few technologies related to value addition.

Training Faculty

Training in crop processing technologies with our faculty will enable one to gain proper perspective and insight in all related topics including fruits, vegetables, meat, meat products, grain handling, quality, storage and packaging. For effective teaching and inculcate entrepreneurial qualities in participants, the faculty concerned with foods and nutrition, food engineering, veterinary sciences, horticulture and related fields shall be the part of core team to share their expertise and knowledge about the emerging technologies in food processing sector.

Course Content: The main topics to be covered during this training are:

1. Importance of Food Processing Technologies
2. Various methods of Food Processing
 - a. Grain processing
 - b. Fruit & vegetable processing
 - c. Milk processing
 - d. Meat processing
3. Minimal Processing methods
4. Shelf life of foods
5. Food Packaging and its importance
6. Nutritional Values

7. Entrepreneurship development – Scope, Finances and Process
8. Quality assurance (HACCP)
9. Food Laws and Regulations
10. Latest technologies in food processing

*CAFT- Home Science Training programme on
Advances in Food Processing Technologies for Value Addition &
Enterprise Development”*

From 21st January to 10th February 2015

DETAILS OF THE TRAINING PARTICIPANTS

LIST OF PARTICIPANTS

Slno	Name	Designation	Discipline	University
1	Mrs. Mayuri Bora	SMS	Home Science Extension, Krishi Vigyan Kendra, Nalbari	Assam Agricultural University (AAUJ), Jorhat
2	Mrs. Babita Sharma	SMS	Home Management/Family Resource Management, Krishi Vigyan Kendra, Kamrup Assam Agricultural University, Jorhat	Assam Agricultural University (AAUJ), Jorhat
3	Mr. Govind Pradip Tagalpallewar	Assistant Professor	Food Science & Technology, College of Food Processing Technology and Bio energy	Anand Agricultural University, Khetiwadi, Anand, gujarat
4	Mrs. Moloya Gogoi	SMS	Food & Nutrition, Krishi Vigyan Kendra Assam Agricultural University Gellaphukuri Road, Tinsukia Pin-786125, Assam	Assam Agricultural University (AAUJ), Jorhat
5	Dr. Suresh Chandra	Assistant Professor	Agricultural engineering and food technique	Sardar Vallabhbhai patel University of Agricultural and food technology, meerut.UP
6	Mrs. Roopa Bai R S	Assistant Professor	Agricultural Engineering	Dept. of Processing and Food Engineering. College of Agri. Engineering, Univ. of Agri. Sciences, Raichur ,karnataka- 584 102
7	Dr. Parveez Ahmad Para	Assistant Professor	Livestock Products Technology	Department of Livestock Products Technology Arwali Veterinary College,Sikar RAJUVAS- Rajasthan 332001
8	Dr Shubhangi Vijay Kumar Alexander	Assistant Professor	Agriculture Economics	College of Agriculture Godchiroli Maharastra
9	Dr. Arun Gurunath Kharate	Assistant Professor	Veterinary Public Health	veterinary public health and epidemiology veterinary college Bidar 585401 Karnataka
10	M Venkaeshwara Reddy	Assistant Professor	Department of Horticulture	College of Agriculture Rajendranagar Hyderabad, Telangana

11	Mrs. Janagam Indumathi	Assistant Professor	Livestock Products Technology	Department of livestock products technology, College of Veterinary Science, Tirupati, chittoor, AP
12	Mrs. Rashmi. H.B	Assistant Professor	Post harvest technologies	University of Horticulture, Bagalkot, Karnataka
13	Dr J Suresh	Scientist	Millets scheme	RARS Palem, Rajendra nagar, Hyderabad, Telangana
14	Dr. Triveni	Assistant Professor	Veterinary Extension	DE SVVU, Tirupati, AP
15	Dr. Sanjay Kumar Bharati	Assistant Professor	Livestock Products Technology	U.P. Pt. Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwa Vidhyalaya Evem Go Anusandhan Sansthan (DUVASU), Mathura
16	Mrs. M Padma	Assistant Professor	Food processing & Food Engineering	Agricultural college, Jagityala. Telangana
17	Mrs. K Lavanya	Assistant Professor	Processing and Engineering	College of Agricultural Engineering, Bapatla, AP
18	Mr. Viresh M Hiremath	Assistant Professor	Post harvest technologies	University of Horticulture Bagalkot, Karnataka
19	Dr. Lalita shukla	Assistant Professor	Home Science Extension	G.B. Pant University of Agriculture and Technology (GBPUAT), Pantnagar, UP
20	Mrs. Dipti Chintamani Patgaonkar	SMS	Child Development and Family relations	Vasant Rao Naik Marathawada krishi vidyapeeth Parbhani, Maharastra
21	Dr Anila kumari	Assistant Professor	Food & Nutrition	PGRC PJTSAU, Rajendra Nagar, Hyderabad, Telangana
22	Dr Sucharitha Devi	Assistant Professor	Food & Nutrition	PGRC PJTSAU, Rajendra Nagar, Hyderabad, Telangana
23	Mrs. Varsha Kashinath M	SMS	Home Science	Krishi Vigyan Kendra, Tuljapur, Maharastra

LIST OF DROPOUTS

Sl no	Name	Designation	University details	Contact Details	Reason for Dropout
1	Mr. Sasikumar R	Assistant Professor	North Eastern Hill University, Department of Agri-Business Management & Food Technology, Tura, Meghalaya	09863068311 03651223953 sashibiofood@yahoo.co.in	No permission from the university
2	Mrs. Das Mamoni	Associate Professor	Dept. of Food science and Nutrition, AAU, Jorhat	09435052944 drmamonidas@yahoo.co.in	No permission from the university
3	Dr. Sanjay Hirjibhai Akbari	Associate Professor	Dept. Post Harvest Engineering. College of Food Processing Technology, AAU, Anand-388110 (Gujarat)	08511129038 02692261302 shakbari_2004@yahoo.com	No permission from the university
4	Mr. Nileshwar Anandrao Bokade	Assistant professor	Farm Machinery & Power Indira Gandhi Krishi Vishwavidyalaya (IGKV), Raipur	8889939615 nbokade@gmail.com	No permission from the university

CAFT_ HOME SCIENCE: 21 DAYS TRAINING ORGANIZERS AND PARTICIPANTS



RESOURCE PERSONS

Sl. No.	Name of Participant	Designation and Name of the University	Contact details
1.	Mr. A. Satyanarayana	Head, CFTRI Resource center, Habsiguda, Uppal Road, Hyderabad	rchyderabad@gftri.res.in akula_ft@yahoo.com 040 – 27151157 (O)
2.	Dr. P. Nageswara Rao	Professor & Head (Rtd), Institute of Agriculture Engineering & Technology, PJTSAU, Hyderabad	+91 - 9848376010
3.	Dr. Vijaya Khader	Dean (Rtd), Faculty of Home Science, ANGRAU, Hyderabad	vijayakhader@gmail.com +91 - 9848054853
4.	Dr. V. Vimala	Associate Dean & Professor & University Head (Rtd.), College of Home Science, Saifabad, Hyderabad	040 - 23513283
5.	Dr. H. Basappa	Principal Scientist (Entomology), Agricultural Research Service, Directorate of Oilseeds Research, (ICAR), Rajendra Nagar, Hyderabad	hbasappa@yahoo.com basappa@doricar.org +91 – 9618233206
6.	Dr. Saikat Datta Mazumdar	Chief-Operating Officer (COO), NutriPlus Knowledge Programme, Agri-business & Innovation Platform (AIP), ICRISAT, Patancheru, Hyderabad	s.dattamazumdar@cgiar.org +91 - 9000686852
7.	Dr. Anurag Chaturvedi	Dean, Faculty of Home Science & Associate Dean, College of Home Science, PJTSAU, Hyderabad	anuragchaturvedi1955@gmail.com +91 - 9989625202
8.	Dr. K. Manorama	Principal Scientist & Head, Quality Control Lab, PJTSAU, Rajendra Nagar, Hyderabad	makanuri@gmail.com +91 - 9246112225
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10.	Dr. TNVKV. Prasad	Senior Scientist, Nanotechnology Laboratory, Institute of Frontier Technology, RARS, Tirupati	tnkvprasad@gmail.com +91 - 9440342151
11.	Dr. K. Balaswamy	Advisor, National Egg Co-ordination Committee, Basheerbagh, Hyderabad	necpcbalu@gmail.com +91 - 9440060220
12.	Dr. Mahalakshmi V. Reddy	Professor & Head (RMCS) & Director (CAFT), CHSc, PJTSAU, Saifabad, Hyderabad	mahalakshmi.v.reddy@gmail.com +91 - 9849047906
13.	Dr. Ankaiah	Professor & University Head (Plant Pathology) & Principal Scientist & Head, Seed Research & Technology Centre, Agricultural Research Institute, PJTSAU, Rajendra Nagar,	+91 - 9441055272

		Hyderabad	
14.	Dr. K. Kondal Reddy	Associate Dean, College of Veterinary Sciences, Rajendra Nagar, Hyderabad	Kkkreddy5@rediffmail.com +91 – 9346490040 040 – 24015143
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18.	Dr. J. Dilip Babu	Director of Research, Dr. Y. S. R. Horticultural University, Post Box #7, Venkataramanna Gudem.	dr@drysru.edu.in +91 – 8818284311 +91 – 9848065637
19.	Prof. M. Ramakrishna Rao	Founder and Director of the Society for Energy, Environment and Development	seed@seedngo.com 040 – 23608892 +91 – 9652687495 +91 - 9849287894
20.	Dr. R. Prasanna Kumar	Associate Professor & Head, Dept. of Live Stock Product Management, College of Veterinary Sciences, Korutla	repalleprasannakumar@gmail.com +91 - 7658975781
21.	Dr. V. Chinni Preetham	Professor & Head, Department of Poultry Sciences, College of Veterinary Sciences, Korutla	velpula1997@gmail.com +91 - 9908576612
22.	Dr. V. Sudershan Rao	Scientist D, Food & Drug Toxicological Research Centre, National Institute of Nutrition, ICMR, Hyderabad	vemulasr@yahoo.com +91 - 9848710468
23.	Dr. R. Koteswara Rao	Adjunct Faculty and consultant, NIRD, Rajendra Nagar, Hyderabad	koteswararao.r@rediffmail.com +91 - 9440203912
24.	Mr. Raghu Pujjuri	Entrepreneur, Bottom of Form, 8- 2-108/5, G.N Reddy Godown, Opp. Central Grammar High School, Hastinapuram, Hyderabad	vsrfoods@gmail.com +91 – 9246165589 +91 - 9391117666
25.	Dr. K. Uma Maheswari	Professor & University Head (Foods & Nutrition) & Programme Director (Food Technology),	kumamaheswari2019@gmail.com +91 – 9949500753

		PGRC, PJTSAU, Rajendra Nagar, Hyderabad	
26.	Dr. T. V. Hymavathi	Professor, PGRC, PJTSAU, Rajendra Nagar, Hyderabad	hymasarathi@gmail.com +91 - 9849280806
27.	Dr. V. Vijaya Lakshmi	Professor, CHSc, , Saifabad, PJTSAU, Hyderabad	lakshmivvdr18@gmail.com +91 - 7382334018
28.	Dr. Paul Pandian	Executive Director, National Fish Development Board, Ameerpet, Hyderabad	pl_pndn@yahoo.com +91 - 9491390937
29.	Mr. Nagpal Chirkutrao Lohakare	Regional In-charge, Agricultural and Processed Food Products Export Development Authority (APEDA), 8th Floor, Chandra Vihar Building, M. J. Road, Hyderabad	apedahyd@apeda.gov.in 040-24745940
30.	Dr. Seema Nath	Professor & Head, SABM, PJTSAU, Rajendra Nagar, Hyderabad	seemanath1@gmail.com +91 - 9908121162
31.	Dr. K .Veeranjaneyulu	University Librarian, PJTSAU Rajendra Nagar, Hyderabad	Veeru_1963@rediffmail.com +91 - 9989625235
32.	Director	National Research Center on Meat, Chengicherla, PB No. - 19, Boduppall post, Hyderabad	nrcmeat_director@yahoo.co.in 040 - 29801672/73/74
33.	Mr. B. Srinivasan	Scientist(Rtd.), CFTRI, Hyderabad	bsrinivasan2003@gmail.com +91 - 0924785810
34.	Dr. Jessy Abraham	Assistant Professor, AIIMS, Raipur, Chattisgarh	jessyabraham@outlook.com +91 - 8518881729
35.	Dr. Usha Dixit	Scientist D, National Information Center, Department of Science & Technology, New Delhi	usha.dixit@nic.in
36.	Dr. M S. Chaitanya	Associate Professor, CHSc, Saifabad, Hyderabad	chaitanya.benarji@gmail.com +91 - 8331024686
37.	Dr. D. Bhagya Lakshmi	Assistant Professor, EEI, PJTSAU, Rajendra Nagar, Hyderabad	bhagya.dunga@gmail.com +91 - 9908011456
38.	Mr. A. Poshadri	Assistant Professor, College of Agricultural Engineering, PJTSAU, Sanga Reddy	poshadri_fst@yahoo.co.in +91 - 9492828965
39.	Mr. R. Vijay Kumar	Executive - Sales, Morde Foods Pvt. Ltd., 55/1, Victoria Building, Dr. B. A. Road, Byculla, Mumbai	r.vijaykumar@morde.in +91- 81215 49549

SCHEDULE OF EVENTS

Day	Date	Time	Topic	Name & designation of speaker / Institute
1	21/01/2015	9.30 to 10.45AM	Registration and Pre-evaluation	Course Coordinators
		11.00 to 12.15PM	Inauguration	<u>Key note Address:</u> Mr. A. Satyanarayana , Head, CFTRI Resource center, Habsiguda, Uppal Road, Hyderabad
		1.15 to 2.30PM	Pre evaluation	Course Coordinators
		2.45 to 3.30PM	Orientation	Course Director
		3.45to 4.30PM	Visit to PJTSAU Museum	Course Director
2	22/01/2015	9.30 to 10.45AM	Rice milling	Dr. P. Nageswara Rao , Professor & Head (Retd.), Institute of Agriculture Engineering & Technology, PJTSAU, Hyderabad.
		11.00 to 12.15PM	Grain processing for value addition and enterprise development	Dr. Vijaya Khader , Dean Faculty of Home Science (Rtd.), ANGRAU, Hyderabad
		1.15 to 2.30PM	Processing of Sorghum for Enterprise development	Dr. V. Vimala , Associate Dean & Professor & University Head (Rtd.), College of Home Science, Hyderabad
		2.45 to 4.00 PM	Funding Agencies for Project Proposals	Dr. Raja Rama Reddy , Consultant, Planning and Monitoring Cell, PJTSAU.
		4.00 to 5.00 PM	Visit to RKVY Sorghum processing and incubation centre	Course Director & Millet processing center In - charge
3	23/01/2015	10.30 to 11.30 AM	Entrepreneurial Opportunities in Food Processing	Dr. Saikat Datta Mazumdar , Chief-Operating Officer (COO), NutriPlus Knowledge Programme Agri-business and Innovation Platform (AIP), ICRISAT, Patancheru, Hyderabad
		1.15 to 4.00PM	Visit to ICRISAT	
4	24/01/2015	9.30 to 10.45AM	Functional foods & Nutraceuticals	Dr. T. V. Hymavathi , Professor, PGRC, PJTSAU, Rajendra Nagar, Hyderabad
		11.00 to 12.15PM	Role of Biotechnology in development of food processing enterprise	Dr. K. Manorama , Principal Scientist & Head, Quality Control Lab, PJTSAU, Rajendra Nagar, Hyderabad
		1.15 to	Role of food processing	Dr. K S M S. Raghava Rao , Chief

		2.30PM	equipment for setting up small and medium entrepreneurship development	Scientist, Dept of Food Engineering, CFTRI, Mysore
		2.45 to 4.00PM	Technology transfer for enterprise development	Dr. K S M S. Raghava Rao , Chief Scientist, Dept of Food Engineering, CFTRI, Mysore
5	25/01/2015	SUNDAY – HOLIDAY		
6	26/01/2015	Visit to Horticulture Expo 2015 and Sightseeing around the city		
7	27/01/2015	9.30 to 10.45AM	Introduction of Nano Science and Nanotechnology	Dr. T N V K V. Prasad , Senior Scientist, Nanotechnology Laboratory, Institute of Frontier Technology, RARS, Tirupati
		11.00 to 12.15PM	Application of nanotechnology to Food science and other sciences for development of enterprises	Dr. T N V K V. Prasad , Senior Scientist, Nanotechnology Laboratory, Institute of Frontier Technology, RARS, Tirupati
		1.15 to 2.30PM	Production, popularization and marketing of poultry and poultry products	Dr. K. Balaswamy , Advisor, National Egg Co-ordination Committee, Basheerbagh, Hyderabad
		2.45 to 4.00PM	Visit to QC Lab	Dr. K. Manorama , Principal Scientist & Head, Quality Control Lab, PJTSAU, Rajendra Nagar, Hyderabad
8	28/01/2015	9.30 to 10.45AM	Development of entrepreneur skills	Dr. Mahalakshmi V. Reddy , Professor & Head (RMCS) & Director (CAFT), CHSc, PJTSAU, Saifabad, Hyderabad
		11.00 to 12.15PM	Bakery processing technologies for development of an enterprise	Dr. V. Vijaya Lakshmi , Professor, CHSc, PJTSAU, Saifabad, Hyderabad
		12.15 to 1.30PM	Visit to Various Departments of College of Home Science, Saifabad.	Course Coordinators
		1.15 to 4.00PM	Recent advances in packaging for food processing business	Mr. B K Karna , Director, Packaging Clinic & Research Institute (PCRI), 114/1 st Floor, Amrutha Ville, Opp. Yashoda Hospital, Raj Bhavan Road, Somajiguda, Hyderabad
		4.30 to 5.30PM	Visit to Packaging Clinic & Research Institute (PCRI)	Course Director
	29/01/2015	9.30 to 10.45AM	Post harvest processing of fruits and vegetables for value addition	Dr. J. Dilip Babu , Director of Research, Dr. Y. S. R. Horticultural University, Post Box #7, Venkataramanna Gudem, WG district
		11.00 to 12.15PM	Advances in spices processing technologies	Mr. A. Poshadri , Assistant Professor (Food Technology), College of Agricultural Engineering, PJTSAU,

				Sanga Reddy
		1.15 to 4.00PM	Utilization of underutilized foods for value addition	Dr. K. Uma Maheswari , Professor & University Head (Foods & Nutrition) & Programme Director (Food Technology) Post Graduate & Research Centre, PJTSAU, Hyderabad
10	30/01/2015	9.30 to 10.45AM	Value added fermented and non fermented Nutri beverages for food trading	Dr. Kavita Waghray , Professor & Head, Department of Food technology, Osmania University, Hyderabad
		11.00 to 12.30PM	Advances in Pro-biotic and Pro-biotic supplements as food industries	Dr. K. Kondal Reddy , Associate Dean, College of Veterinary Sciences, Rajendra Nagar, Hyderabad
		1.15 to 2.30PM	Promotion of cultivation of Millets through Value Chain Management	Dr. B. Dayakar Rao Principal Scientist Agriculture Economics Directorate of Sorghum Research Rajendra Nagar, Hyderabad
		2.30 to 3.30PM	Visit to Millet Processing Unit at DSR, Rajendra Nagar, Hyderabad	Dr. B. Dayakar Rao Principal Scientist Agriculture Economics Directorate of Sorghum Research Rajendra Nagar, Hyderabad
		4.30 to 6.00PM	Innovative solar processing technologies for income generation	Prof. M. Ramakrishna Rao , Founder and Director of the Society for Energy, Environment and Development.
11	31/01/2015	9.30 to 10.45AM	Phytosterols as functional ingredient for development of value added food products.	Dr.K.Aparna , Assistant Professor, Department of Foods and Nutrition, PGRC, PJTSAU, Hyderabad.
		11.00 to 12.15PM	Diversified uses of oilseed crops	Dr. H. Basappa , Principal Scientist (Entomology), Agricultural Research Service. Directorate of Oilseeds Research, (ICAR), Rajendra Nagar, Hyderabad.
		1.15 to 4.00PM	Visit to AP Dairy Development Corporation Hyderabad.(APDDC)	Course Coordinator
12	01/02/2015	SUNDAY – HOLIDAY (Sightseeing around Hyderabad)		
13	02/02/2015	9.30 to 10.45AM	Food safety evaluation of raw and processes foods for marketing	Dr. V. Sudershan Rao , Scientist D, Food & Drug Toxicological Research Centre, National Institute of Nutrition, ICMR, Hyderabad

		11.00 to 12.15 PM	Advances in management of live stock feed for improvement in yield and quality of live stock products (meat , poultry and eggs)	Dr. R. Prasanna Kumar , Associate Professor & Head, Dept. of Live Stock Product Management, College of Veterinary Sciences, Korutla, Kareem Nagar District
		12.15 to 1.30PM	Support of banks and their schemes for establishment of food enterprises	Dr. R. Koteswara Rao , Adjunct Faculty and consultant, NIRD, Rajendra Nagar, Hyderabad
		2.30 to 5.00PM	Visit to M/s VSR Foods Private Limited, Hyderabad	Mr. Raghu Pujari Entrepreneur, Bottom of Form, 8- 2-108/5, G.N Reddy Godown, Opp. Central Grammar High School, Hastinapuram, Hyderabad
14	03/02/2015	9.30 to 10.45AM	By-Product Utilization from Food Processing Industry	Dr. K .Uma Maheswari , Professor and University Head, Department of Foods and Nutrition, PGRC, PJTSAU, Hyderabad.
		11.00 to 12.15PM	Advances in post harvest management of food grains	Dr. M.V.Naidu , Director, Seed Research & Technology Centre.
		1.15 to 2.30PM	Introduction to fish processing technologies	Dr. Paul Pandian , Executive Director, National Fish Development Board, Ameerpet, Hyderabad
		2.45 to 4.00PM	Development of value added fish products using advance in fish processing for enterprise development	Dr. Paul Pandian , Executive Director, National Fish Development Board, Ameerpet, Hyderabad
15	04/02/2015	9.30 to 10.45AM	Chocolate Making	Dr. W. Jessie Suneetha , Assistant Professor, Department of Foods and Nutrition, PGRC, PJTSAU, Hyderabad.
		11.00 to 12.15 PM	Food processing for export Marketing	Dr. T.Sudhkar , Regional In-charge, Agricultural and Processed Food Products Export Development Authority (APEDA), 8th Floor, Chandra Vihar Building, M. J. Road, Hyderabad
		1.15 to 4.00 PM	e-Resources in Agriculture and allied sciences	Dr. K. Veeranjanyulu , University Librarian, PJTSAU, Rajendra Nagar, Hyderabad
		4.00 to 6.00PM	Visit to National Fish Development Board	Course Coordinator
16	05/02/2015	9.30 to 10.15AM	Feasibility analysis of value added production enterprises	Dr. Seema Nath , Professor & Head, SABM, PJTSAU, Rajendra Nagar, Hyderabad

		11.30 to 1.15PM	CFTRI Regional Centre – Recent advances in Food processing technologies developed by CFTRI- Field visit.	Sri. A. Satyanarayana , Head, CFTRI Resource Centre, Near NGRI Campus, Habsiguda, Uppal Road, Hyderabad
		2.30 to 4.00PM	Processing meat and meat products for value addition – NRC, Changicharla	Director , National Research Center on Meat, Chengicherla, PB No. – 19, Boduppall post, Hyderabad
		4.30 to 5.30PM	The State of art of IQF Technology for production, procurement processing and marketing of baby corn , fruits and vegetables- Visit to VH Agro Foods Private Limited, Uppal, Hyderabad	Dr. V K V. Prasad , Managing Director, V H Agro Foods Private Limited, B-9/11,IDA,Hyderabad
17	06/02/2015	9.30 to 12.15PM	Writing a winning grant proposals for projects to establish a new enterprise	Dr. Usha Dixit , Scientist D, National Information Center, Department of Science & Technology, New Delhi
		1.15 to 2.30PM	Extrusion technology for value addition and enterprise development	Mr. B. Srinivasan , Scientist (Rtd.), CFTRI, Hyderabad
		2.45 to 4.00PM	Novel proteins for value addition and enterprise development	Dr. Jessy Abraham , Assistant Professor, AIIMS, Raipur, Chattisgarh
18	07/02/2015	9.30 to 4.00PM	Pedagogy Training	Dr. M S. Chaitanya , Associate Professor, CHSc, PJTSAU, Saifabad, Hyderabad & Dr. Bhagya Lakshmi , Assistant Professor, EEI, PJTSAU, Rajendra Nagar, Hyderabad
19	08/02/2015	SUNDAY – HOLIDAY		
20	09/02/2015	9.30 to 10:45 AM	Processing of poultry and eggs for value addition and enterprise development	Dr.M.Sathyavani , Assistant Professor, Department of Livestock Product Technology, College of Veterinary Sciences, Korutla, Kareem Nagar district.
		11.00 to 12.15PM	Post-Evaluation	
		3.00 to 4.00 PM	Valedictory	
21	10/02/2015	9.30 to 3.00 PM	Project Proposals	Presentation by participants
		3.30 to 5.00PM	Wrap Up Session	CAFT Director and Staff Course Director and Coordinators

Day to Day Report on the Training

21st January 2015

A 21 day training programme on ‘**Advances in Food processing technologies for Value addition and Enterprise Development**’ was conducted from March 21st to February 10th, 2015 at Post Graduate & Research Centre, Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad. Dr. K.Uma Maheswari was the Course Director and Dr. K.Aparna and Jessi Suneetha W were the Co-coordinators for the training programme.

The programme was started with registration and distribution of training kits. The knowledge of participants was measured by administering a questionnaire before starting the training program.

Inaugural Function: The program was inaugurated at Committee Hall, Central Library, PJTSAU, Hyderabad. The Chief Guest, Dr. A.Satyanaraya, Scientist F and Head CFTRI, Resource Center, Hyderabad. The University Registrar Dr.V.Praveen Rao, Dr. Anurag Chaturvedi, Dean i/c and Associate Dean of Home Science, Dr. Mahalakshmi V. Reddy, CAFT Director, Dr. K. Uma Maheswari, Course Director were on the dais. Dr. Mahalakshmi V. Reddy, CAFT Director had welcomed all the participants for the Training Programme on ‘Advances in Food processing technologies for Value addition and Enterprise Development’. She gave a brief introduction about Center for Advanced Faculty Training in Home Science (CAFT). She also spoke about the aims and objectives of CAFT. The Course Director Dr.Uma Maheswari explained about the need and importance of the training programme, objectives and various topics and activities to be covered under the 21 days training programme in detail.

The chief guest of the function, Dr.A.Satyanaraya, Scientist F and Head CFTRIE spoke about the importance of Food Technologies. The participants were enlightened with his speech. CAFT Newsletter and CAFT handout were released by the chief guest. The program ended formally with vote of thanks, proposed by Dr. K. Aparna, Assistant Professor, Department of Foods and Nutrition. Post Graduate and Research Center, PJTSAU. All the people who were involved directly and indirectly in the programme were thanked for their valuable contributions.

Visit to University Museum:

As part of exposure visit 21 Days Training Programme of Center for Advanced Faculty Training (CAFT) - Home Science on “Advances in Food Processing Technologies for Value Addition and Enterprise Development”, a visit was arranged to university museum at Professor Jaya Shankar Telengana State Agricultural University, on the afternoon of first day i.e. on 21.01.2015. Dr. Lalitha gave warm welcome and explained about the university i.e. Number of Colleges, Research stations and Extension units etc. She explained about the major crops grown in Telengana state their production, productivity, different types of soils, cultivation practices, variety of grains, disease and pest resistant varieties, sources of water, newly introduced varieties, farm implements and pioneer to release new varieties. She also explained about the technologies available in Home Science and Agriculture and Agricultural Engineering. Under viable technologies in Home Science some of the patented technologies such as ice cream freezer and fish vending table etc., were explained. The education material that was developed in Telugu and English were exhibited. The material was developed for the farmers so that they can keep in their pockets. The visit was accompanied by course director Dr.K.Uma Maheswari and Co-coordinator Dr.Jessey Suneetha.

22nd January 2015

The day started with lecture delivered by Dr.P. Nageswara Rao, Professor and Head (Rtd), Institute of Agriculture Engineering and Technology, PJTSAU, Hyderabad on the topic on recent advances of Rice milling where he basically focused on importance of proper rice milling and various steps of milling rice. He mentioned that clean and good quality paddy can give a yield of 74% of rice, but because of traditional method of milling, it is not possible to get 74% of yield. He explained the stages of rice processing with flow diagram and classified some methods of evaluating rice quality based on head rice, broken rice, and total rice recovery. Dr. Rao also enlightened the participants about various equipments required for processing paddy and the principles of functioning of rice processing equipment and their power consumption. He also explained the process of rice polishing and whitening of rice with shiny talcum powder, glucose and water. He winded up the session with grading and bagging stages of rice and clarified the queries of participants regarding parboiled rice, single polishing and double polishing rice, fortification of rice etc.

The second lecture was delivered by Dr. Vijaya Khader, Dean, Faculty of Home Science (Rtd), ANGRAU, Hyderabad on 'grain processing for value addition and enterprise development'. She focused on importance of processing and different kinds of processing i.e. primary, secondary and tertiary processing. She said processing is for prevention of grain loss and also as well as for value addition. She explained about the trends in food production, processing and consumption etc. She mentioned how food technology hunger in the world is and how it can facilitate ensuring food security. During her lecture she discussed about the traits required for establishing and managing an enterprise by an entrepreneur. Dr. Khader later shared processing of soy bean where she discussed about various value added soya products, different steps involved in their preparation and health benefits of soy bean and soya products.

The second session started with a lecture delivered by Dr. D. Rajarami Reddy, on the topic funding avenues for research. He started his session with explanation about "concept note" which is required to be prepared prior to actual formulation of research proposal and contents of a concept note. He explained and presented information on various funding agencies which extend support for research and extension purposes. He mentioned about the different factors of rejecting a proposal by the funding agencies.

Later, in the afternoon session there was a lecture by Dr. V. Vimala, Associate Dean and Professor and University Head (Rtd) College of Home Science, Hyderabad on the topic sorghum processing as a source of value added products for enterprise development. She discussed about the nutritional benefits of sorghum and reasons for under utilization of the millet in spite of having high nutritive value and health benefit. She explained processing technology of sorghum both primary and secondary processing. She also explained about the value added sorghum products. In her lecture she discussed about the traits required for being a successful entrepreneur.

After that towards the end of the day the participants were taken to Millet Processing unit which was established with financial support from RKVY. Dr.T.V.Hymavathi explained about the different equipment required for sorghum processing and their functioning.

23rd January 2015

A visit was arranged to ICRISAT at 10.00am. The team was welcomed by Mr. Prashant. He explained the goals and objectives of ICRISAT. He said that ICRISAT was a platform of support for Agri-Business and innovation. Then Mr. Sunil broadly highlighted the mission and vision of ICRISAT. He informed the participants that enhancing agricultural development through entrepreneurship development, innovation and partnership was the main objective of ICRISAT. ICRISAT worked for Agri-Enterprise development and well being of the farmer. Key partners of ICRISAT amongst various others were-NSTEDM, DSIR, ICAR, ASSOCHAM and FICCI.

In the second session, Dr. Saikat Datta Mazumder, Chief Operating Officer, Nutriplus knowledge (NPK) program delivered a talk on “Entrepreneurial opportunities in food processing.” He emphasized that in present times, the scope of food processing enterprise is expanding due to many factors. He elaborated these factors with statistics, advancing age demographics, increase in health care costs, time pressure, and social trends towards convenience, all of which contributed to the expansion of food processing industry. He highlighted the key opportunities due to

- Global age wave
- Health and wellness awareness
- BRIC & beyond
- Innovative new products & services
- Hybrid nutrition

In the afternoon, the trainees were taken for a visit to the ICRISAT farms. Mr. M.M. SHARMA, Farm Manager, very enthusiastically showed the farm and explained the different programs running in ICRISAT. He showed the germ plasm of sorghum wherein 4500 different species were collected from the world over. The trainees were also shown the rain water harvesting systems. The participants then were taken to the ICRISAT museum where different models and works were displayed. The trainees observed and understood the different models depicted of the

works done by ICRISAT in India and South Africa. The trainees then returned back with an enriched mind and experience.

24th January 2015

Dr.T.V.Hymavathi, Professor, PGRC delivered a lecture entitled “Global trends in Nutraceuticals and functional foods” which covered nutraceuticals, functional foods, designer foods, supplementary foods with dietary sources and cosmoceuticals. They provide a lot thought the use, importance and market trends of the Nutraceuticals and functional foods in India and USA. This was followed by a lecture by Dr. K. Manorama, Prof and Head, QC Lab on role of biotechnology in the development of food processing enterprise. She covered the general historical as well as new milestone idea of biotechnology application in agricultural and allied sciences. Biotechnology is a tool which is using different disciplines like medicine, agriculture and food processing etc. The role of biotechnology at present time is limited. It has a wide scope in food enterprise, biosensor, e-nose, can be used as a non-destructive tool in food to identify the quality of food at any stage.

In the afternoon two lectures i.e. (1) Role food processing equipment for setting small and medium entrepreneurship development and (2) Transfer of technology for enterprise development were delivered by Dr. K.S.M.S. Raghava Rao, Chief Scientist, Department of Engineering, CFTRI, Mysore. He emphasized the need of knowledge of Food Engineering prior to developing a new technology. The mode of presentation and interaction with participants was excellent.

26th January 2015

The participants visited Horti Expo, 2015 , held at People’s Plaza, Necklace Road, Hyderabad, This is followed by site seeing to some of the locally important areas like Birla Temple, Tank Bund, NTR garden, Lumbini Park etc.

27th January 2015

During morning session on 27th January 2015, two lectures entitled “Introduction to Nanoscience and Nanotechnology and their diverse applications” and “Application of Nanotechnology” were

presented by Dr. T.N.V.K.V. Prasad, Senior Scientist, Nanotechnology, Institute of Frontier Technology, RARS, Tirupati. He explained about recent advances in nanotechnology and Nanoscience. He told that it offers a wealth of new opportunities for food enterprises. Nanotechnology and Nanoscience play an important role in food industry to address all the societal challenges such as obesity etc. Research on nano materials within the food sector is the best way for the development of food industry.

During the afternoon session on the same day, one lecture entitled “Production, polarization and marketing of poultry and poultry products.” was presented by Dr.K.Balaswamy, Advisor, National Eggs coordination committee, Basheerbagh, Hyderabad

The recommendations from the sessions are:

1. Indian poultry sector has made a tremendous growth since last decade.
2. Poultry farming in India is an accumulation of many years of innovation in a face of tough circumstances
3. Poultry industry is a unique platform for the poultry small entrepreneurs, farmers and poultry processing industries for investment opportunities
4. Eggs are great healthy food as they are unadulterated, nutritious and marvelous wonder food.

During the same day, a visit to “Quality control lab” at PJTSAU, Rajendra Nagar, Hyderabad was organized. Dr.K.Manorama, Principal Scientist, discussed various aspects of Quality control and Quality assurance and the recommendation are

- a. Contaminated foods can be dangerous to health; therefore there is a necessity of Quality control.
- b. A detailed emphasis was given on various instruments used in various laboratories for the estimation of various contaminations in food and food products.
- c. An overview over the proximate analysis microbiological analysis of various foods and food Products are also given.
- d. Analysis of various food samples is essential for a Quality assurance.
- e. Quality management is essential for a quality and healthy food.

28th January 2015

In the morning session the participants were visited the floral craft production unit at College of Home Science, Hyderabad. Dr. Mahalakshmi V. Reddy, Professor & Head (RMCS) & Director (CAFT), described in detail the freeze drying technology used for flowers.

Later Dr. V. Vijaya Lakshmi, Professor, delivered lecture on Bakery processing technologies for development of an enterprise. She concluded her session saying that there is wide scope for bakery industry in India as it is a second largest country to consume bakery products.

The second lecture was delivered by CAFT, Director Dr. Mahalakshmi V. Reddy on Development of Entrepreneurship skills very dynamically & enthusiastically she expressed her views regarding entrepreneurs, characteristics & qualities of entrepreneurs, market research etc. She concluded her talk discussing various successful entrepreneurs which was developed by CAFT, support.

In afternoon session, CAFT participants visited various departments of Home Science College such as clothing & textile lab, natural dyes lab, Food & Nutrition Dept, radio studio etc. During the visit participants were equipped with lot of knowledge on fashion designing, eco-friendly Holi colors, block printing sarees etc.

In the afternoon Dr. B. K. Karna, Director, Packaging Clinic & Research institute (PCRI), Hyderabad gave brief information regarding “Recent Advances in packaging for Food processing business”. In his lecture, he emphasized on importance of packaging, exploring the packaging for prevention of losses, safe bag project etc. After that, participants were taken to the packaging clinic & research institute, where participants were explained about advanced equipment used for testing of food packaging material by Dr. Karna. He explained that eighty types of different tests can be performed by using these equipment.

29th January 2015

The first session conducted was on the topic entitled “Post harvest processing of fruits and vegetable for value addition” by Dr. J. Dilip Babu. He discussed about the National priorities for domestic and export food security, including how to prevent the losses during processing and

also discussed about stagnation of technologies, which has very high impact throughout the economy. He projected recent trends in processing of fruits and vegetables of different countries including India and explained the opportunities for processed food products in India. He discussed practical problems in the preparation of processed products like jam, jellies, pickles both in organized and unorganized sectors. He explained about recent developments in processing and utilization of by-products obtained from fruits and vegetables. He addressed the new opportunities and benefits of instant and Ready to eat foods, ethnic foods, pre processed products etc. The need for packaging, food safety and quality like HACCP, ISO, and GM'S regarding fruits and vegetables was also explained.

The second session was on 'Advances in spice processing Technologies' by Dr.A. Poshadri. He excellently discussed the introduction of spices in India and position and share of India in world regarding spices. Also he discussed the demand of Indian spices in other countries. There are 5 major spice categories including Major spices, Seed, Tree, Herbal and Miscellaneous spices. He spoke about the problems associated with spice production including high microbial load and aflatoxin contamination. He discussed the losses of valuable compounds due to conventional processing and storage. He discussed the different processing techniques of spice to avoid microbial contamination i.e. sterilization process of spices including fumigation with ethylene oxide, irradiation, steam treatment and high hydrostatic pressure. He discussed the process, advantages and disadvantages of different microbial decontamination techniques for spices. He gave an account on different processing techniques of spices including grinding. He discussed about application of different spice powders like straight spice powder, culinary powder, masala powder, seasonings taste makers, soup mix blends etc. Difference between the traditional and cryogenic grinding of spices, advantages of cryogenic grinding at sub zero temperatures ranging from 0 to 70⁰ F, and extraction process for oleoresins were explained.

The third session conducted was on the topic entitled under utilized foods by Dr.K.Uma Maheswari Professor and Head, Department of Foods and Nutrition, PG&RC. She gave brief description on an account of under-sterilized foods and their nutritional and therapeutic importance. She discussed about different underutilized foods like amaranthus seed, triticale, baby corn, bear fruit, acerola, wood apple, underutilized roots and tubers, cashew apple, Jackfruit, bael, Tamarind, pink mushrooms etc. She discussed about extraction of natural food

colours using microencapsulation and nanotechnologies and development of micronutrient enriched value added products from selected underutilized foods like papaya, jamun, pumpkin, black grapes, tomato, beetroot. She discussed about further research on nano particles. She explained that constraints in the use of underutilized foods for the synthesis of nano particles are limited germ plasm availability, lack of technical information, lack of national policy, lack of interest by researches, extension workers and lack of producer's interest. It was emphasized that value added products prepared with underutilized foods are highly nutritious and have excellent therapeutic, functional and nutraceuticals properties to satisfy the demand of the health conscious consumers.

30th January 2015

The morning session started with the lecture on Value added fermented and non fermented Nutri beverages for food trading by Dr. Kavita Waghray, Professor & Head, Department of Food technology, Osmania University, Hyderabad. She explained about the new trends in beverage industry.

The Second session was handled by Dr. K. Kondal Reddy, Registrar, College of Veterinary Sciences, Rajendranagar, and Hyderabad. His talk was on 'Advances in Pre-biotic and Pro-biotic supplements in food industries'.

The third session was on 'Promotion of cultivation of Millets through Value Chain Management' by Dr. B. Dayakar Rao Principal Scientist agriculture Economics Directorate of Sorghum Research Rajendranagar, Hyderabad followed by visit to Millet Processing Unit at DSR.

31st January 2015

The first session was conducted on phytosterol as functional ingredients for value addition by Dr.K.Aparna. The session was focused on the lifestyle disorders, the threat caused to human due to the hypercholestremia and the role of phytosterols in reducing the cholesterol content in the blood.

They compete with the absorption of cholesterol molecules being similar in structure with the cholesterol molecules. If phytosterols are consumed with fruits like oranges absorption of

cholesterol is decreased. Companies are producing and supplying ready to use phytosterols in the form of powders. Practical demonstration of phytosterol fortification is shown after the session.

The second session was on diversified uses of oilseed crops by Dr. Basappa, Principal Scientist, DOR, Hyderabad. He explained in detail about the use of oilseeds in different food and non-food industries and their nutritional significances.

In the afternoon, a visit was arranged to Andhra Pradesh Dairy Development co-operative federation, Hyderabad. The quality analysis of milk by different tests like MBRT, RRT, Rapid platform tests, quality control, cream separation equipment, Pasteurization, types of milk like toned, double toned, standardized and condensed milk, UHT processing, spray drying, preparation of sterilized flavored milk, homogenized milk, butter and ghee manufacture and packaging machines were shown.

2nd February 2015

The morning session was started with Food safety evaluation of raw and processes foods for marketing by Dr. V. Sudershan Rao, Scientist D, Food & Drug Toxicological Research Centre, National Institute of Nutrition, ICMR, Hyderabad. He explained about the brief historical background of food regulations in India and recent act introduced in the year 2006 i.e. food safety and standard authority of India.

Second session was by Dr. R. Prasanna Kumar, Associate Professor & Head, Dept. of Live Stock Product Management, College of Veterinary Sciences, Korutla, Kareem Nagar District . He spoke on dvances in management of live stock feed for improvement in yield and quality of live stock products (Meat, poultry and eggs).

The third session was on Support of banks and their schemes for establishment of food enterprises by Dr. R. Koteswara Rao, Adjunct Faculty and consultant, NIRD, Rajendra Nagar, Hyderabad After that a visit to M/s VSR Foods Private Limited, Hyderabad headed by Mr. Raghu Pujari, Entrepreneur, , Hyderabad was arranged.

3rd February 2015

In the morning session, a video on the processing of vegetables was played for 15 minutes. Then the role and importance of by-product utilization in food industries was explained by Dr. K.Uma Maheswari, Professor and Head, Department of Foods & Nutrition. In waste disposal and by-product utilization, two methods are there. They are animal feed - ex. Spent grains, distillery waste and fertilizer feed - ex. Sludge. There are many difficulties in the utilization of by-products such as higher water content, high levels of enzymatic activity etc. There are different types of waste in food industry based on origin of the waste like fish processing plants, sugar manufacturers, dairies, brewers etc. During primary processing of food grains, different by-products are obtained based on the type of product. For example, in processing of paddy the by-products obtained are bran, husk, and milled rice. The major by-products obtained from wheat milling are wheat gluten which is used for bakery industry, pet foods, breakfast foods etc. In oil seed by products, rice bran oil used as food and feed for livestock and poultry. The wastage from fruits and vegetables is also utilized as by-products such as in citrus fruits, peel used as essential oils, pectin etc. In livestock products industry, the by-products obtained from edible fat, gelatin & non edible-carcass meal, bone meal etc. were explained in detail.

Dr.N.V. Naidu, Director (seeds) gave lecture on 'Post harvest Management in Field crops'. He explained the importance to harvest seed crop at a time that will allow good yields. Seed moisture content at physiological maturity normally ranges between 18-40%. The operations which are done after harvesting are stacking, stripping, threshing drying and storage. Parameters used to grade the seed are seed size, length, seed shape, seed color, seed affinity, seed surface texture, seed conditioning etc. There are two important factors in determining the lives of the seed i.e moisture content and safe storage. Polymer coating of seeds is basically done for vegetables to improve physical appearance.

In the afternoon session, "Introduction to Fish processing and postharvest technologies" is explained by Dr. P.Paul Pandian, Executive Director, NFDB. The steps involved to minimize spoilage are use of chlorinated water, insulated boxes and quality ice etc. He explained the various unit operations involved in fish processing technologies such as drying, salting, curing,

icing, smoking, freezing, canning and IQF. Described value added fish products like minced fish or Cheema, fish cutlets, fish wafer, fish fingers, fish sausages etc.

4th February 2015

The session started with preparation of chocolate in home scale. Dr. Jessie Suneetha W, Assistant professor of PGRC, PJTSAU, demonstrated chocolate making procedure by using dark chocolate compound and non diary whipping cream. Various mass were used and participants themselves learnt how to design and garnish chocolate with various toppings. At the end the chocolate prepared was served to all the participants for sensory evaluation.

Dr. Sudershan gave a brief introduction about food processing industry, present situation and future scope about the processing industry in India and also the emerging trends of the world for export standards for mango to be exported to various countries were discussed. The processing industries established for processing of mango were idle as mango is a seasonal crop and they were made to work throughout the year by including guava and tomato. He also explained about the importance of food processing with the intervention made from APEDA for export quality grapes. APEDA'S interventions made farmers to establish cold storages. He also explained briefly about organic production of crops. in the discussion he emphasized the potential of crops like Yelakki Baale and Nanjanagudu Baale and their export to several countries.

e-resources in Agricultural and allied Sciences

Professor. K. Veeranjanyulu, University librarian, PJTSAU, Hyderabad gave brief introduction to traditional library, Virtual library and various e-resources viz. CeRa, Agricat, krishibhrabha, CAB India state department, Cab-e-books, Screen direct digital library of common reposition, high wire, open BOAR, Agricultural carrier, Agri's important online CSIR explanation, digital library of India etc. The speaker gave detailed explanation about the usage and the information present in the above given e-resources. He also provided hands on training to the participants to acquaint themselves with various websites, as e-resources.

Visit to National Fishery Development Board: The Participants interacted with Dr. P. Paul Pandeyan, ED, NFDB and clarified their doubts related to training program and various schemes being supported by NFDB after hearing a brief introduction to NFDB from the Executive Director.

5th January 2015

The first session was an informative lecture on “**Feasibility analysis of value added production enterprises**” by Dr. Seema, Professor & Head, SABM and PJTSAU. She started her lecture with the story of ‘Dukes Biscuits’ to explain why feasibility analysis is an important tool to help assess the viability of starting a new value-added business or re-organizing or expanding an existing business. It provides important information needed to make the critical decision of whether to go forward with a business venture. Then she gave information on different assessment factors with examples. She said that the first step of assessment is assessing availability of market. A market assessment may be conducted that will help determine the viability of a proposed product in the marketplace. The market assessment will help to identify opportunities in a market or market segment. If no opportunities are found, there may be no reason to proceed with a feasibility study. If opportunities are found, the market assessment can give focus and direction to the construction of business scenarios to investigate in the feasibility study. A market assessment will provide much of the information for the marketing feasibility section of the feasibility study.

She also gave an example of ‘PEPSICO’ to explain the second step of assessment that is assessing the availability of raw material. Then she enlightened how important it is to assess availability and feasibility of technology and she also focused on the importance of conceptual skills, technical skills and manual skills while starting a project. She also shed light on how government subsidies are given to prioritized areas. She also explained what care should be taken during implementation of a project. By giving an example of WTO dumping and antidumping policy, she beautifully explained about assessment of risk exposure in a business. She finally explained how to do SWOT analysis and take a decision for proceeding with a project or a business.

Visit to CFTRI Resource Centre, Near NGRI Campus, Hyderabad

Dr. Jyothirmai, Scientist, CFTRI's Resource Centre Hyderabad gave a lecture on vision and goals of CFTRI as well as various R&D projects carried out by the centre, rendering technical assistance to the local industries and Government organizations, analysis of industrial food samples & issuing of reports, transfer of technology, conducting the techno-economic surveys, participation in societal missions and creating awareness by conducting technology counseling and entrepreneurship development programs for starting the food industries in the region. Then she focused on different technologies developed for value addition of food products. She also said that the centre is equipped with good pilot plant and instrumentation facilities and has expertise in:

- Processing and preservation of fruits and vegetables
- Food additives including Natural food colors
- Design of different prototype equipment/gadgets useful in food processing

After the lecture the equipment available in different labs were shown to the participants. She also gave a demonstration on extraction of pulp from fruits and vegetable by using fruit and vegetable pulping equipment. She also explained about other equipment like pappad making machine, steam jacket kettle, automatic potato peeler/slicers/drier, canning etc...

Visit to National Research Center on Meat, Hyderabad

Dr. Muthukumar and Dr. Lakshman took the participant to different laboratories in NRC and explained research activities carried out in NRC. Some important points they highlighted are

- The National Research Centre on Meat, Hyderabad is the premier institution in meat research and meat production-processing-utilization technology development in India. This institution was conceptualized in 1986 at IVRI Campus, Izatnagar for research on meat science and technology. Though initial steps were taken, it was later shifted to Hyderabad and started functioning at Chengicheria (Near Uppal).
- It was aimed at conducting applied research in meat science and technology and to establish infrastructure facilities for development of relevant technology, processes and practices for meat production.

- This centre is providing need based training for different levels of personnel in meat and allied sectors and maintains a liaison with industry and trade. It is also a national repository of information in meat and allied sectors.
- This national research centre has seven sections for Meat animals and meat inspection, fresh meat technology, microbiology and quality control, marketing, economics and statistics, training, consultancy and extension. It boasts of a world class laboratory too.
- Till now, the centre has developed different and innovative technologies for small scale meat processing, producing cured and smoked meat products, producing shelf stable meat products and production of heavier broilers for value added meat products identification of species and sex of animals etc.
- The centre is also undertaking series of innovative trainings and workshops on meat processing, value addition and clean meat production among butchers, meat processors, consumers and exporters. It has developed technologies for value addition to tough meat from old and culled animals and spent hens and brought out a lot of meat delicacies too. Several new entrepreneurs have benefitted from the tailor made hands-on training program of the centre.

The services available with the centre

- Analysis of meat and meat products
- Differentiation of meats from different species and sex
- Shelf life and consumer evaluation of meat and meat products
- Project reports for Slaughterhouse and meat processing plants
- Contractual research and consultancy
- Development of grading in meat animal marketing
- Research on Value addition of meat products for the meat industry
- Research on processing technologies, proteomics and meat quality
- Updating of meat Inspection practices
- Chemical residues analysis in meat

With its advanced infrastructure and a committed and trained faculty, NRC is promoting entrepreneurship and imparting trainings, consultancy, licensing and technical-know-how on meat technology and industry. It is ready to assist the prospective entrepreneurs and

organizations on developing employment skills or setting up own business related to meat industry.

VISIT to VH Agro foods Pvt Ltd, Hyderabad

Participants were given a demonstration on individual quick freezing (IQF) technology. They were shown the processing of instant snack foods like vegetable nuggets, instant samosa, instant kababs and baby corn etc. They were also exposed to demonstration of coconut shell peeling and coconut powdering equipment.

6th February 2015

The First session was started at 9.30 on writing a winning grant proposal for projects to establish a new enterprise by Dr. Usha Dixit, Scientist, NSTEDB division of department of science and technologies, New Delhi. She started with the organizational structure of ministry of science and technology. Dr. Dixit explained about the role of National Science and Technology entrepreneurs of country. She presented a snapshot of different NSTEDB activities and discussed about different schemes to promote entrepreneurship park (STEP), Technology business incubation (TBI) etc. She also explained the women Entrepreneurship schemes, what are the pull and push factors for women to become an entrepreneur and gave different scenarios of women entrepreneurship park (STEP), Technology business incubation (TBI) etc. She cited several examples of developed entrepreneurs from Sundarban, Orissa, Coimbatore and Karnataka who are already proved to be successful entrepreneurs. Dr. Dixit also discussed about different women organizations which support women entrepreneurs. Later she explained the pro-forma for submitting project proposal under different schemes of DST.

In the second session, Dr.Suresh presented his project proposals on “Conservation of agro bio diversity of small millets” and “Post harvest technology and value addition in smaller millet’. Ms. Babita Sharma presented a proposal on “promotion of small scale processing of underutilized fruits and vegetables as income generating activity for women” and Dr.Triveni presented a proposal on “Fattening of Ramlams as an initiative to combat drought in semi-arid districts of Andhra Pradesh. In all the proposals Dr. Dixit put forward some suggestions for improvements before submitting it to Department of Science and Technology.

In the afternoon session Dr. B.Srinivasan delivered lecture on extrusion technology for value addition and enterprise development where he initially gave the production scenario of Indian grains followed by different methods and techniques of extrusion. Later, Dr. Jessy Abraham, Assistant Professor, Department of Biotechnology, AIIMS, Raipur, delivered lecture on “Novel proteins for value addition and enterprise development” where she focused on traditional resources of proteins, their merits and demerits, different sources of novel proteins.

8th February, 2015

One day pedagogy training was conducted by Dr. Chaithanya and Dr. Bhagya Lakshmi, Assistant Professors (Extension) as it is mandatory under CAFT Training Programme. The participants had an insight in to lifestyle skills needed as a trainer.

9th February 2015

Evaluation of the Training

On the last day of the training, participants were provided with the post evaluation schedule, to assess the knowledge gained through the 21 days training on ”Advances in Food processing technologies for Value Addition and Enterprise Development”. Clearly there was substantial difference in the test scores of the participants between the pre and post evaluation. Participant feedback on the training program too was obtained and most sessions were rated as either excellent or very good. They also stated that the topics covered were very useful to all the participants. A few suggestions were given at the end of the training such as

- Inclusion of shelf life studies
- Demonstration of value added products
- Certain topics such as bakery and beverages etc. needs to be strengthened

Valedictory: The training program was concluded with the valedictory function on 9th February 2015. The chief guest was Dr.D. Rama Rao, Director NAAM, and Dr.V Praveen Rao, Registrar & Special Officer, Professor Jayashankar Telangana State Agricultural University. Dr. Anurag Chaturvedi, Associate Dean and Dean i/c Faculty of Home Science, Hyderabad presided over the

function. Dr. Mahalakshmi V. Reddy, CAFT Director welcomed the gathering. Dr.K.Uma Maheswari, Course Director gave a brief report on all the activities carried out during the training program. Dr. D. Rama Rao, Director NAAM, Released the CD's of 21 days training program. Dr. Anurag Chaturvedi, Associate Dean, College of Home Science, Hyderabad addressed the gathering about the importance of establishment of incubation centres for processing and value addition to different foods based on the locality. The chief guest stressed the need and importance of Value addition and Enterprise Development in India. He focused on the participants stating that they are the ambassadors in their respective universities to promote this kind of trainings. After the speech, certificates were distributed by the chief guest to all the participants.

10th February 2015

On 10th February, 2015, a visit to irradiation unit, PJTSAU, Hyderabad was organized . The application of radiation for preservation of various fruits and vegetables was demonstrated. A detailed overview on various aspects of cold sterilization preservation was given. Same day, a visit to Grape research Station, Rajendra Nagar was arranged where various nutritional aspects of grapes were briefed to the participants. Also technique related to preparation of wine and raisin making was demonstrated.

During the afternoon session, award distribution ceremony was held in the CAFT room, PGRC, where five best participant's viz., Dr Parveez Ahmad Para, Dr Lalita, Mrs. Rashmi, Dr. Arun and Dr J. Suresh were awarded by the CAFT Director for their overall performance during the training program. Course director CAFT, coordinators and media was also present at this ceremony.

Director, CAFT thanked all the participants and presented freeze dried flowers to all of them as a token of memory. All the participants applauded the efforts of organizers for wonderful arrangements during the training in pertinence to food, lodging, visits etc.



**INAUGURATION BY THE CHIEF GUEST, DR. A SATYANARAYANA
& DR.PRAVEEN RAO**



SESSIONS BY DR. KAVITHA WAGRHAY, DR.H BASAPPA, DR.K. APARNA, DR.K KONDAL REDDY, DR. DILIP BABU & DR. K. UMA MAHESWARI



SESSIONS BY DR.V.SUDARSHEN RAO,DR.P. PRASANNA KUMAR, DR.R.KOTESWARA RAO, DR.PAUL PANDIAN DR.UMA MAHESWARI DR. T SUDHAKAR, DR. K. VEERANJENEYULU & DR. MAHALAKSHMI V REDDY



SESSIONS BY DR. ANURAG CHATHURVEDI, DR CHAITANYA KUMARI AND DR.BHAGYA LAKSHMI, DR.SEEMA NATH &DR .USHA DIXIT.



CHOCOLATE MAKING DEMONSTRATIONS BY DR. JESSIE SUNEETHA. W



VISIT TO HOME SCIENCE COLLEGE AND FROZEN FLOWERS LABORATORY



VISIT TO ICRISAT, HYDERABAD



VISIT TO QUALITY CONTROL LABORATORY, PJTSAU, HYDERABAD



VISIT TO NFDB HYDERABAD



VISITS TO CFTRI & NATIONAL RESEARCH CENTER ON MEAT HYDERABAD.



VISIT TO VH AGRO FOODS



VISIT TO PJTSAU MUSIUM



CAFT TRAINING PROGRAMME VALEDICTORY FUNCTION ON 9TH FEBRUARY-2015

***CAFT- 21 days Training programme on
“Advances in Food Processing Technologies for Value Addition &
Enterprise Development”
From 21st January to 10th February 2015***

POST EVALUATION REPORT

CAFT- 21 days Training programme on
“Advances in Food Processing Technologies for Value Addition &
Enterprise Development”

From 21st January to 10th February 2015

COURSE CONTENT EVALUATION

Date	Topic	Guest speaker / Institute	Excellent	Very Good	Good
22/01/2015	Rice milling	Dr. P. Nageswara Rao, PJTSAU	7(30)	8(35)	8(35)
	Grain processing for value addition and enterprise development	Dr. Vijaya Khader, Retd. Dean, ANGRA	10(43)	9 (39)	4(17)
	Processing of Sorghum for Enterprise development	Dr. V. Vimala, Retd. Assoc Dean, ANGRAU	10(43)	9(39)	4(17)
	Funding Agencies for Project Proposals	Dr. Raja Rama Reddy, Consultant, PJTSAU	19(83)	3(13)	1(4)
23/01/2015	Entrepreneurial Opportunities in Food Processing	Dr. Saikat Datta Mazumdar, ICRISAT	15(65)	7(30)	1(4)
24/01/2015	Functional foods & Nutraceuticals	Dr. T. V. Hymavathi, PJTSAU	15(65)	8(35)	0
	Role of Biotechnology in development of food processing enterprise	Dr. K. Manorama, QC Labs	18(78)	4(17)	1(4)
	Role of food processing equipment for setting up small and medium entrepreneurship development	Dr. K S M S. Raghava Rao, CFTRI, Mysore	19(83)	4(17)	2
	Technology transfer for enterprise	Dr. K S M S. Raghava Rao, CFTRI, Mysore	17(74)	4(17)	2(9)

	development				
27/01/2015	Introduction of Nano Science and Nanotechnology	Dr. T N V K V. Prasad, RARS, Tirupati	18(78)	4(17)	1(4)
	Application of nanotechnology to Food science and other sciences for development of enterprises	Dr. T N V K V. Prasad, RARS, Tirupati	16(70)	7(30)	0
	Production, popularization and marketing of poultry and poultry products	Dr. K Balaswamy, NECC	9(39)	7(30)	7(30)
28/01/2015	Development of entrepreneur skills	Dr. Mahalakshmi V. Reddy, CAFT Director, PJTSAU	14(61)	9(39)	0
	Bakery processing technologies for development of an enterprise	Dr. V. Vijaya Lakshmi, PJTSAU	12(52)	7(30)	4(17)
	Recent advances in packaging for food processing business	Mr. B K Karna, Packaging Clinic & Research Institute (PCRI)	19(83)	4(17)	0
29/01/2015	Post harvest processing of fruits and vegetables for value addition	Dr. J. Dilip Babu, YSR Horti University	15(65)	7(30)	1(4)
	Advances in spices processing technologies	Mr. A. Poshadri, PJTSAU	20(87)	3(13)	0
	Utilization of underutilized foods for value addition	Dr. K. Uma Maheswari, PJTSAU	18(78)	5(2 2)	0
30/01/2015	Value added fermented and non fermented Nutri beverages for food trading	Dr. Kavita Waghray, Osmania University	7(30)	9(39)	7(30)
	Advances in Pro-biotic and Pro-biotic supplements as food industries	Dr. K. Kondal Reddy, PVNR Veterinary University	17(78)	5(22)	0

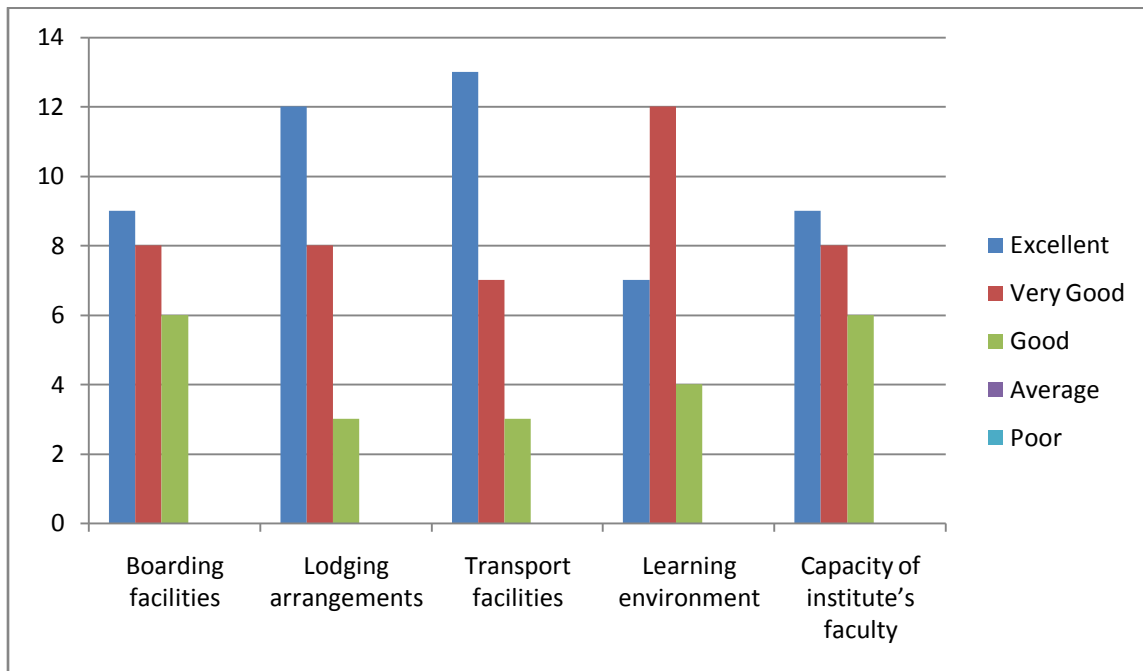
	Promotion of cultivation of Millets through Value Chain Management	Dr. B. Dayakar Rao, DSR	14(61)	9(39)	0
	Innovative solar processing technologies for income generation	Prof. M. Ramakrishna Rao, SEED	17(74)	6(26)	0
31/01/2015	Phytosterols as functional ingredient for value addition	Dr.K.Aparna, PJTSAU	22(96)	1(4)	0
	Diversified uses of oilseed crops	Dr. H. Basappa, DOR	14(61)	7(30)	2(9)
02/02/2015	Food safety evaluation of raw and processes foods for marketing	Dr. V. Sudershan Rao, NIN	12(52)	10(43)	1(4)
	Advances in management of live stock feed for improvement in yield and quality of live stock products (meat, poultry and eggs)	Dr. R. Prasanna Kumar, SV Veterinary University	13(57)	9(39)	1(4)
	Support of banks and their schemes for establishment of food enterprises	Dr. R. Koteswara Rao, NIRD	15(65)	8(35)	0
	Visit to M/s VSR Foods Private Limited, Hyderabad	Mr. Raghu Pujari, VSR Foods	13(57)	8(35)	1(4)
03/02/2015	By-Product Utilization from Food Processing Industry	Dr. K .Uma Maheswari, PJTSAU	16(70)	7(30)	0
	Advances in post harvest management of food grains	Dr. M.V.Naidu, Seed Research & Technology Centre	12(52)	8(35)	3(13)
	Introduction to fish processing technologies	Dr. Paul Pandian, National Fish Development Board	21(91)	2(9)	0

	Development of value added fish products using advance in fish processing for enterprise development	Dr. Paul Pandian, National Fish Development Board	78(18)	4(17)	1(4)
04/02/2015	Chocolate Making	Dr. W. Jessie Suneetha, PJTSAU	14(61)	8(35)	1(4)
	Food processing for export Marketing	Dr. T.Sudhkar, Agricultural and Processed Food Products Export Development Authority (APEDA)	7(30)	5(22)	11(48)
	e-Resources in Agriculture and allied sciences	Dr. K. Veeranjanyulu, PJTSAU	16(70)	6(26)	1(4)
05/02/2015	Feasibility analysis of value added production enterprises	Dr. Seema Nath, PJTSAU	17(74)	6(26)	0
	CFTRI Regional Centre – Recent advances in Food processing technologies developed by CFTRI- Field visit.	Sri. A. Satyanarayana, CFTRI, Hyderabad	12(52)	10(43)	1(43)
	Processing meat and meat products for value addition – NRC, Changicharla	Dr.Muthu Kumar, NRC - Meat	17(74)	6(26)	0
	The State of art of IQF Technology for production, procurement processing and marketing of baby corn , fruits and vegetables- VH Agro Foods Private Limited	Mr. V K V. Prasad, VH Agro Foods	17(74)	4(17)	2(9)

06/02/2015	Writing a winning grant proposals for projects to establish a new enterprise	Dr. Usha Dixit, Department of Science & Technology	14(61)	7(30)	2(9)
	Extrusion technology for value addition and enterprise development	Mr. B. Srinivasan, Free Lance Consultant	15(65)	8(35)	0
	Novel proteins for value addition and enterprise development	Dr. Jessy Abraham, AIIMS	9(39)	9(39)	5(22)
07/02/2015	Pedagogy Training	Dr. M S. Chaitanya, PJTSAU & Dr. Bhagya Lakshmi, PJTSAU	20(87)	3(13)	0
09/02/2015	Processing of poultry and eggs for value addition and enterprise development	Dr.M.Sathyavani, LPT, SV Veterinary University	10(43)	12(53)	1(4)

Post Evaluation feedback on infrastructure facilities

Training facilities	Excellent	Very good	Good	Average	Poor
Boarding facilities	9(39)	8(35)	6(26)	0	0
Lodging arrangements	12(52)	8(35)	3(13)	0	0
Transport facilities	13(57)	7(30)	3(13)	0	0
Learning environment	7(30)	12(52)	4(17)	0	0
Capacity of institute's faculty	9(39)	8(35)	6(26)	0	0



Training facilities

Knowledge Assessment of Pre and Post Evaluation

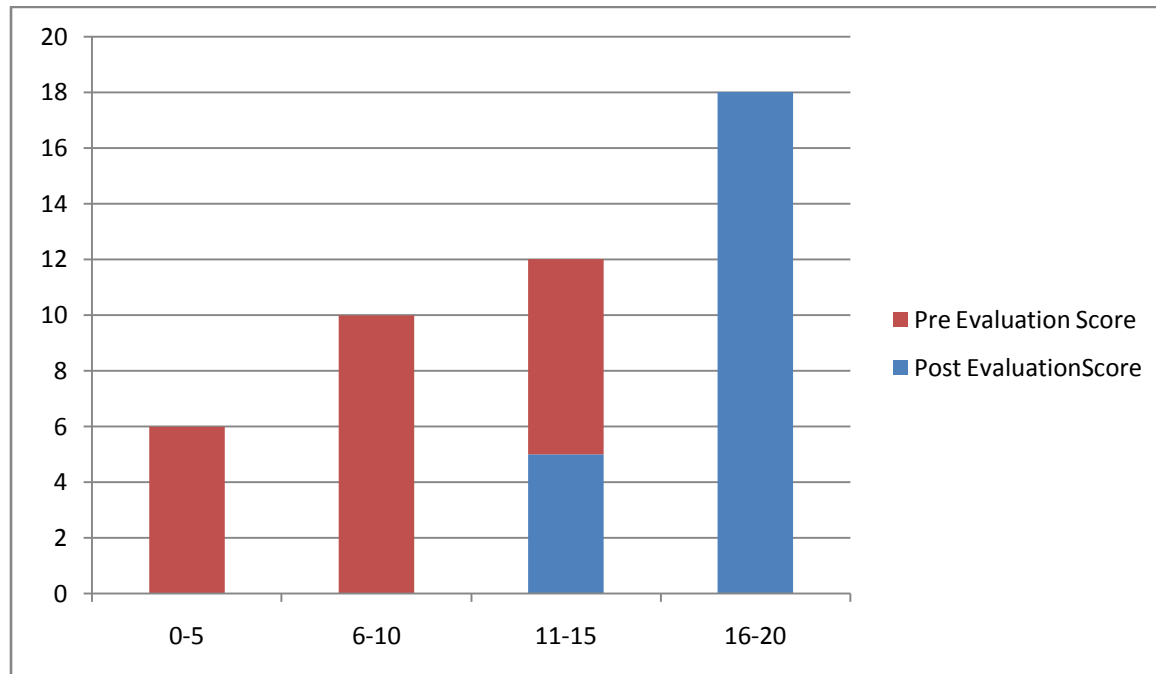
Statistical interpretation on the 21 days training programme

Sl. No	Question	Pre evaluation knowledge assessment score	Post evaluation knowledge assessment score
1	Storage of fruits and vegetables, where the gas changed from that of normal atmosphere and a precise need over the atmospheric composition during storage is _____	13 (57)	22 (96)
2	In pre-cooling, water is mostly removed by _____	4 (17)	12 (52)
3	The correct temperature that frozen food should be kept is _____	14 (61)	23 (100)
4	As per FSSAI (PFA) regulations, the level of BHA that is allowed in butter is _____	11 (48)	20 (87)
5	In ice cream, sugar acts as a _____	3 (13)	22 (96)
6	The moisture content in Intermediate Moisture Meats (IMM) is _____	10 (43)	19 (82)
7	In egg powder production, de-sugaring is done by _____	5 (22)	20 (87)
8	The temperature employed for aseptic packaging of food is _____	8 (35)	14 (61)
9	1 Gy = _____ J/kg absorbed energy	3 (13)	12 (52)
10	The important qualities to be looked into during processing of potato products _____	13 (57)	16 (70)
11	One of the following is an extrinsic factor influencing the shelf life of foods _____	13 (57)	22 (96)
12	The process of bearing risk of running a business is called as _____	8 (35)	15 (65)
13	The water activity of pure water is _____	7 (30)	14 (61)
14	The technology which uses trans membrane potential of bacterial cells and its external environment to inactivate them is called as _____	5 (22)	19 (82)
15	The packaging of a product in a modified atmosphere followed by maintaining subsequent control of that atmosphere is defined as _____	11 (48)	22 (96)
16	An biotechnology process used from times immemorial is _____	8 (35)	23 (100)

17	Oleoresins are obtained from spices by _____	7 (30)	21 (91)
18	Curing of meat is done using _____	9 (39)	20 (87)
19	AGMARK was legally enforced in India in the year	7 (30)	21 (91)
20	The auxiliaries which help in promoting trade are _____	8 (35)	22 (96)

Knowledge Assessment of Pre and Post Evaluation

Statistical interpretation on the 21 days training programme



Knowledge Assessment Chart

No. of questions answered	0-5	6-10	11-15	16-20
Pre evaluation	6	10	7	0
Post evaluation	0	0	5	18

Report on Post Evaluation

1. The training post evaluation revealed the increase in the knowledge level of the participants from 94-100 percent from pre to post evaluation. The lectures given by eminent personalities had provided a clear knowledge and adequate knowledge, experience and confidence. The topic about the writing a winning grant proposal for project to establish a new enterprise. Participant's opinion on training was very good Contents and delivery mechanism, opportunities for hands on experience, resources material provided, extent of involvement of guest faculty and level of training seriousness maintained and arrangement of field trips. It was very good for overall impression about the boarding and lodging arrangements, transport facilities, learning environment and good for Overall impression about the food & stay arrangements. Over-all rating for the training was evaluated by 5-point scale.
2. The Visits various food processing industries and institutes gave an in depth hands on exposure on various value added products and processing technologies
3. Visit to different institutions and organizations gave information on research input and areas for new research to start writing a winning project proposal
4. Training has enlightened about the appropriate steps to make project proposals

Course Evaluation schedule.

Majority of the participants were well satisfied with the lectures given by different specialists from different Institutions where a clear cut view on respective topics, the participants had practical experiences by visiting the many food processing institutions and gained new knowledge on recent developments by the end of the training program.

Suggestions for improvement of the training

- The class room can be made more equipped with good comfortable seating, lighting, smart board location in the class for better comfort view for the participants. – 10%
- Rice processing did not fit under this title because only the basic rice processing steps were covered. – 12%
- Beverages not explained properly – 8%
- Lecture on export quality by APEDA was not satisfactory- 10%
- Under Bakery processing technologies, recent advances were not covered.- 10%
- Quality of food served was not very good at DOR.- 12%

Topics Proposed by Participants for future training:

- New topics which can be added in this training are: Milk and milk processing
- Innovative packaging and Recent advances in packaging
- Advances in shelf life studies.

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*LECTURE NOTES
AND
PRESENTATIONS*

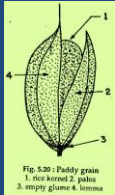
Guest Lectures & Presentations - Hyperlinked

DATE	TOPICS OF LECTURES AND NAME OF THE SPEAKER
22.01.2015	SORGHUM PROCESSING AS A SOURCE OF VALUE ADDED PRODUCTS FOR ENTERPRISE DEVELOPMENT. PROF.VIMALA
22.01.2015	RICE MILLING BY DR.NAGESWARA RAO
22.01.2015	GRAIN PROCESSING BY DR. VIJAYA KHADER
22.01.2015	FINDING AVENUE FOR RESEARCH BY DR.RAJARAM
24.01.2015	NUETRACEUTICALS & FUNCTIONAL FOODS BY DR. HYMAVATHI
24.01.2015	ROLE OF BIOTECHNOLOGY IN DEVELOPMENT OF FOOD PROCESSING ENTERPRISE BY DR.K MANORAMA
24.01.2015	ADVANCES IN FOOD PROCESSING TECHNOLOGIES FOR VALUE ADDITION & ENTERPRISE DEVELOPMENT-1.BY KSMS RAGHAVA RAO
24.01.2015	ADVANCES IN FOOD PROCESSING TECHNOLOGIES FOR VALUE ADDITION & ENTERPRISE DEVELOPMENT-2.BY DR. KSMS RAGHAVA RAO
27.01.2015	APPLICATIONS OF NANOTECHNOLOGY IN FOOD SCIENCES BY TNVKV PRASAD
27.01.2015	INTRODUCTION TO NANOSCIENCE AND TECHNOLOGY AND THEIR DIVERSE APPLICATIONS BY TNVKV PRASAD
28.01.2015	BAKERY PROCESSING TECHNOLOGIES FOR DEVELOPMENT OF AN ENTERPRISE DR. V. VIJAYA LAKSHMI
28.01.2015	DEVELOPMENT OF ENTREPRENEURIAL SKILLS BY DR MAHALAKSHMI V REDDY
28.01.2015	RECENT ADVANCES IN PACKAGING FOR FOOD PROCESSING BUSINESS BY B K KARNA
29.01.2015	INNOVATIVE SPICE PROCESSING BY POSHADRI

29.01.2015	RECENT ADVANCES IN PACKAGING FOR FOOD PROCESSING BY DILIP BABU
29.01.2015	UTILIZATION OF UNDER UTILIZED FOODS BY DR K UMA MAHESWARI
30.01.2015	VALUE CHAIN DEVELOPMENT IN SORGHUM BY DR.B.DAYAKAR RAO
30.01.2015	PRO-BIOTICS - CHALLENGES FOR INCORPORATION IN FOODS PROF. K. KONDAL REDDY
30.01.2015	SOLAR DRYER NTEGRATED WITH FOOD PROCESSING TECHNOLOGIES FOR WOMEN EMPOWERMENT BY RAMAKRISHNA (SEED)
30.01.2015	VALUE ADDED FERMENTED AND NON-FERMENTED NUTRI BEVERAGES FOR TRADING BY DR KAVITHA WAGHRAY
31.01.2015	DIVERSIFIED USES OF OIL SEEDS BY DR BASAPPA
31.01.2015	PHYTOSTEROLES BY DR. K APARNA
02.02.2015	BANKING SUPPORT FOR SME SECTOR BY KOTESWARA RAO
02.02.2015	REGULATORY REQUIREMENTS OF FOOD BUSINESS BY DR. V SUDERSHAN RAO
02.02.2015	ADVANCES IN MANAGEMENT OF LIVESTOCK FEEDS FOR IMPROVEMENT YIELD AND QUALITY OF LIVESTOCK PRODUCTS BY DR. PRASANNA KUMAR
03.02.2015	INTRODUCTION TO FISH PROCESSING AND POST HARVEST TECHNOLOGIES BY DR P PAUL PANDIAN
03.02.2015	DEVELOPMENT OF VALUE ADDED FISH PRODUCTS BY DR P PAUL PANDIAN
03.02.2015	POST HARVEST MANAGEMENT BY M V NAIDU
04.02.2015	REGULATORY AND CERTIFICATION ASPCTS OF ORGANIC PRODUCTS BY T SUDHAKAR

04.02.2015	E- REOURCES HOME SCIENCE BY VEERANJANEYALU
04.02.2015	E – RESOURCES BY VEERANJANEYALU
04.02.2015	FREE BOOKS BY VEERANJANEYALU
04.02.2015	OPEN ACCESS JOURNALS ON HOME SCIENCE BY VEERANJANEYALU
04.02.2015	OPEN ACCESS PORTAL BY VEERANJANEYALU
04.02.2015	OPEN SOURCE BY VEERANJANEYALU
05.02.2015	FEASIBILITY ANALYSIS OF VALUE ADDED PRODUCTION ENTERPRISES BY DR SEEMA
06.02.2015	DST PRESENTATION BY USHA DIXIT
06.02.2015	EXTRUSION TECHNOLOGY BY SRINIVASAN
06.02.2015	NOVEL PROTIENS BY JESSY ABRAHAM
07.02.2015	PEDAGOGICAL REFLECTIONS BY DR. K.BHAGYA LAKSHMI
07.02.2015	PEDAGOGY THE ART OF TEACHING BY DR CHAITANYA KUMARI
08.02.2015	RADIATION PROCESSING - A TOOL FOR FOOD PROCESSING AND PRESERVATION BY DR ANURAG CHATUVEDI
09.02.2015	PROCESSING OF LIFE STOCK PRODUCTS FOR VALUE ADDITION AND ENTERPRISE DEVELOPMENT BY DR. MADHU SAHITYA

RICE MILLING PROCESS BY DR. P.NAGESWARA RAO



RICE MILLING

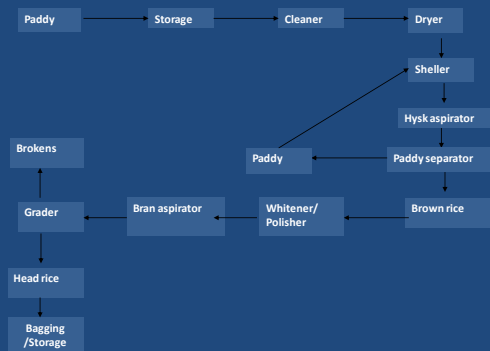
- Today rice has become one of the most important and major food grains of the world.
- Nearly 1/2 to 2/3 of total world population has partially or totally adapted rice as their main food.
- Asians meet half of their daily energy requirements through intake of rice. Most of the protein needs are met through rice only.

- Paddy undergoes certain processing treatments prior to its conversion into edible form.
- The various unit operations are cleaning, drying, storage, parboiling (optional) and milling.
- The edible portion of paddy is called rice.
- The kernel is enclosed by hull or husk.
- The weight of hull is 18-22% of the total weight of paddy grain.
- The endosperm weights about 70 to 74%, whereas 4-6% bran is removed during polishing. Paddy in India is traditionally milled in hullers

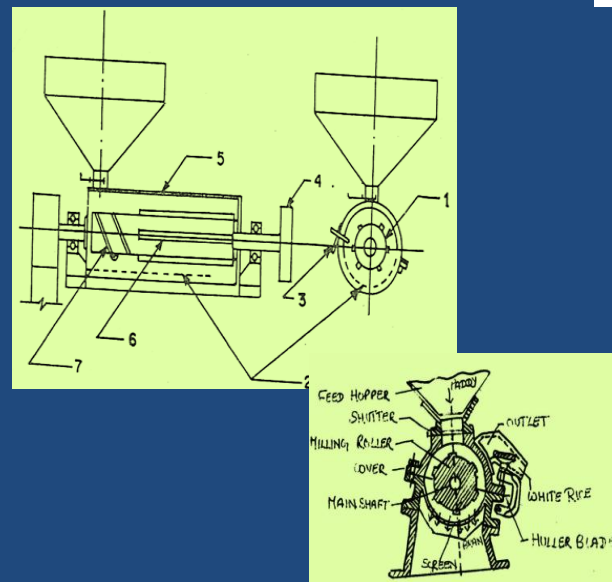
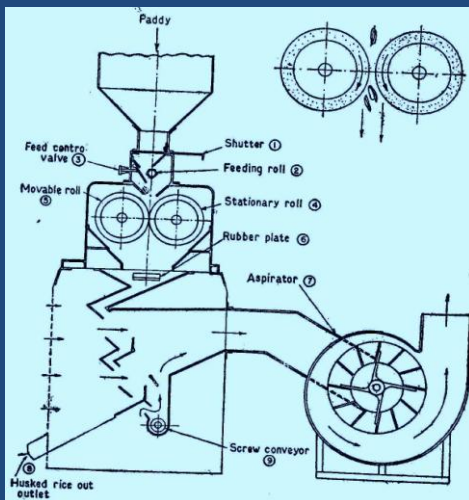
Rice Mill Manufactures

- M/s. Fowler Westrup India (P) Ltd., Bangalore
- M/s. CIMBRIA HEID, Austria & Denmark
- M/s. OSAW Agro Industries, Ambala
- M/s. INDOSAW, OSAW Industrial Products Pvt. Ltd, Osaw Complex, Jagadhri Road, Ambala Cantt-133001.

Basic flow chart of rice processing in a modern mill



Rubber-roll Sheller



FUNDING AVENUES FOR RESEARCH

BY

DR. D. RAJA RAM REDDY

Educational Institutions

- Teaching
- Creating Learning Resources
- Conducting Research
- Guiding PG Research
- Conducting Extension Programmes
- Consultancy

Research Needs....

- Interest
- Motivation
- Academic support
- Administrative support
- Financial support
- Subordinates' support
- Family support
- Health & Age

Funds for Research....

- Institutional
- Local bodies
- State Government Organizations
- Central Government Organizations
- International bodies
- Company based R&D
- NGOs
- Consultancy

Government of India

- Building Material & Technology Promotion Council (BMTPC)
- Ministry of Agriculture
- Ministry of Health
- Ministry of Education
- Ministry of Environment
- Ministry of Human Resource Development
- Ministry of Non-conventional Energy Sources
- Ministry of Rural Development
- Ministry of Science and Technology
- Housing and Urban Development Corporation (HUDCO)
- Indian Council of Philosophical Research (ICPR)
- Indian Navy
- Indian Renewable Energy Development Agency (IREDA)
- National Wasteland Development Board (NWDB)

UGC assistance to colleges:

- Multifaculty colleges with Professional courses- one lakh per course
- Classical language colleges- 5 teachers – 60 to 100 students(Rs. 2 lakhs), 101-200 (Rs. 3 lakhs), 201 and above (Rs. 4 lakhs)
- Single faculty- Law/ Phyl Edn., Social work, Management, Home science, Music & dance, Fine arts - 60-79 (Rs. 3 lakhs) to 400-599 (Rs. 9 lakhs), above 600(Rs. 10 lakhs)

University Grants Commission:

- UGC ASSISTANCE TO COLLEGES:
- (UNDERGRADUATE EDUCATION)-
- Plan period
- College must have at least 3 teaching depts. With a minimum no of permanent teachers
- (exclude Principal, Phyl. Edn staff / Librarian).
- Must have at least 250 students in degree classes above +2 stage(150 in case of women's colleges and colleges located in backward, rural/tribal areas or educating 50% of SC/ST)

GRAIN PROCESSING AS A SOURCE OF VALUE ADDED PRODUCTS FOR ENTERPRISE DEVELOPMENT

BY

DR VIJAYA KHADER



Production of Different Grain Crops In India :

- Cereals & Millets**
- Legumes & Pulses**
- Nuts & Oil Seeds**

(More than 200 million Tonnes of different food Grains)

- Rice, Wheat,
- Sorghum, Pearl Millet, Maize,
- Bengal Gram ,Red Gram,
- Ground Nut , Rape seed & Soya Bean

(Primary Milling is the major activity)

Need and Importance of grain Processing

The earliest cultivated cereals – Wheat, rice, barley, millets, buck wheat & oats.

Primary Processing (Threshing, Winnowing, Cleaning, Drying & Bagging) – for storage

Secondary Processing (Dehusking, Milling, Soaking, Grinding) – Value Addition

Tertiary Processing (Frying, Deep-Frying, Cooking, Blanching)

Processing Of Food Grains Value – Addition : Flour, Grits, Semolina etc.

Ready to eat, breakfast foods such as noodles, flakes, ready mixes, porridges, beverages malted products.

Processing for loss prevention :

- Threshing – 2.0%
- Transportation – 0.50%
- Rodents – 2.5%
- Birds – 1.0%
- Insect Pests – 2.5% ; Processing – 1.00%

SOYBEAN – IN THERAPEUTICS

Soybean has great potential in solving the problems of protein energy malnutrition.

a) Soybean for diabetics :

The glycemic response of soy incorporated (40 %) recipes namely *Roti, Upma, Dhokla* and *Chole* was assessed in normal subjects.

The glycemic response of the diabetic subjects with soy *chole* was lower than that with Bengalgram *chole*.

b) Soybean safeguards the cardio vascular health :

Highly unsaturated fatty acids and contains approximately 7 % of omega, 3 % of alpha linolenic fatty acids. Research indicates that omega – 3- poly unsaturated fatty acids in the diet is beneficial to cardiac health.

FOOD APPLICATION OF SOY PRODUCTS

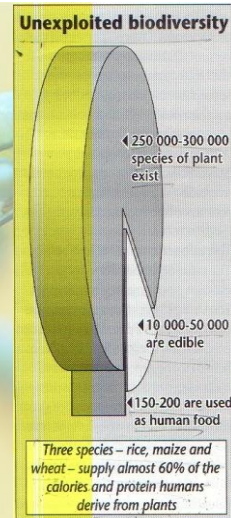
A large number of functional properties are attributed to soy protein. There are no standard tests available for measuring functional properties of soy proteins.

Table 2 : Functional properties of soy bean proteins

Property	Food system
Emulsification	Bread Cakes
Emulsion formation	Whipped topping Frozen desserts
Emulsion stabilization	Sausages, Soups
Fat absorption promotion	Meat Doughnuts
Prevention of excess fat absorption	Cereal foods
Water absorption promotion and retention	Cereal products, meat patties, pan cakes, bread cakes
Gelation	Coagulated products (pancer) thickening agents in soups and gravies
Fibre formation	Simulated meats
Dough formation, adhesion	Baked goods, sausages, meat rolls and meat loaves
Elasticity	Baked goods, simulated meat
Colour control bleaching	Breads
Aeration	Whipped toppings, confectionary items

Un exploited biodiversity

2,50,000-3,00,000 species of plants exist, 10,000-50,000 are edible 150-200 are used as animal food. Three species – rice, maize and wheat – supply almost 60% of the calories and protein humane drive from plants.



SORGHUM PROCESSING AS A SOURCE OF VALUE ADDED PRODUCTS FOR ENTERPRISE DEVELOPMENT

BY
V VIMALA

Low Sorghum Use - Reasons

- **Colour**
- **Coarseness**
- **High Fibre content**
- **Long Cooking time**
- **Difficulty in traditional Dehulling**
- **Lack of Technical Knowhow for Sorghum processing**
- **Non availability of primary and secondary processed sorghum products in the market**

SORGHUM ENTERPRISES

ENTERPRISES WITH PRODUCTS OF PRIMARY PROCESSING

- Dehulled Sorghum
- Flour
- Rava

ENTERPRISES WITH PRODUCTS OF SECONDARY PROCESSING

- Breakfast Foods
- Snack Foods
- Dehydrated Foods
- Baked Foods
- Composite Foods
- Instant Mixes
- Infant Foods



Processing Technologies....

◆ Products of Primary processing



Sorghum flour



Sorghum Rava

◆ Products of Secondary processing



Puffing



Extrusion

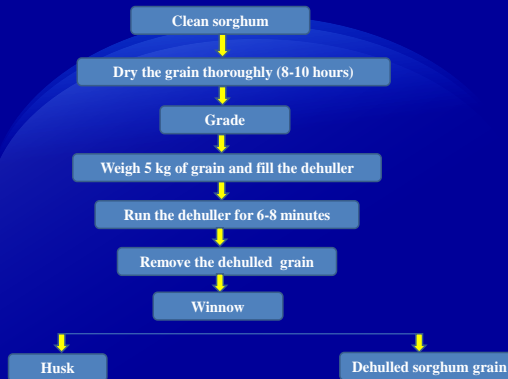


Baking



Malting

MECHANICAL DEHULLING OF SORGHUM



BAKED PRODUCTS STANDARDISED FOR SORGHUM ENTERPRISE

Product	Proportion of ingredients sorghum: white flour	Baking time (min)	Temperature (°C)	Overall acceptability
Salt Biscuits	80:20	20:35	350	Good
Fruit Biscuits	100	30	350	Very Good
Coconut Biscuits	80:20	30	350	Very Good
Bun	50:50	30	450	Fair
Shermal	50:50	30	150	Poor
Fruit cake	80:20	45	350	Very Good
Cup cake	80:20	20	350	Good
Muffins	80:20	20	350	Good
Madelines	80:20	30	350	Very Good
Genoese sponge cake	100	20	380	Fair

ROLE OF BIOTECHNOLOGY IN DEVELOPMENT OF FOOD PROCESSING ENTERPRISE

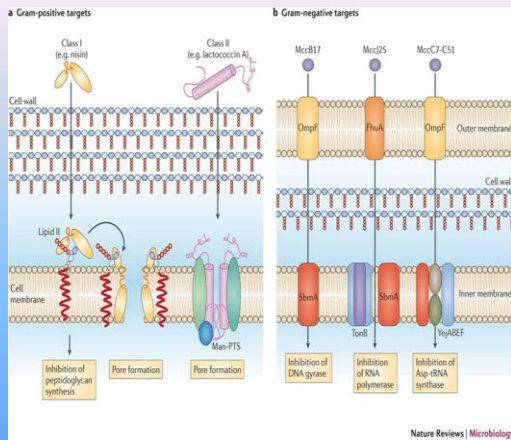
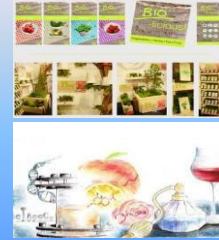
BY
DR. K MANORAMA

Applications of Biotechnology in Food Processing

- Application of biotechnology to food processing in developing countries is an issue of debate and discussions for a long time.
- Biotechnological study as practical to bio-processing in the bulk of rising countries, targets development and improvement of customary fermentation processes.
- However there are a few issues which need to be discussed in developing countries while using the technology for various applications

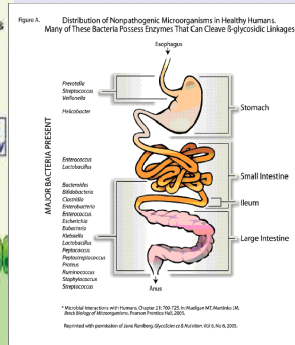
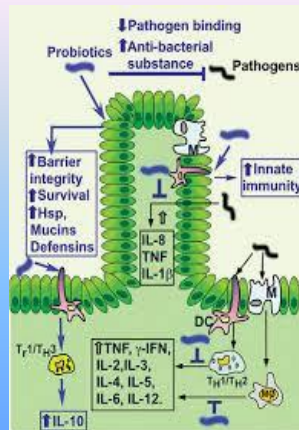
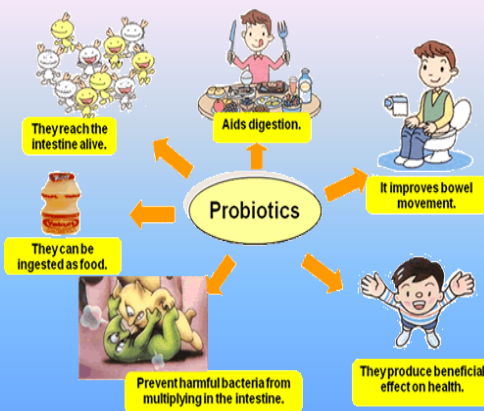
Bio-Production of flavour

- Flavour includes sensation of taste and smell
- Most natural flavours are mixtures of chemicals like terpenes, aldehydes, esters, lactones, phenols, etc
- They are mostly secondary metabolites of plants and some from animal foods
- New technological tools have been developed from microbial genetics , fermentation and enzymatic processes



APPLICATIONS

- Biotechnology has application in four major industrial areas, including health care (medical), crop production and agriculture, non food (industrial) uses of crops and other products (e.g. biodegradable plastics, vegetable oil, biofuels), and environmental uses.
- Applications of Biotechnology in Medicine
- Applications of Biotechnology in Agriculture
- Applications of Biotechnology in Food Processing



ADVANCES IN FOOD PROCESSING TECHNOLOGIES FOR VALUE ADDITION & ENTERPRISE DEVELOPMENT

BY
DR. K S M S RAGHAVA RAO

Food Processing Operations



- Diverse & Complex



Transport Phenomena in Food Process Engineering

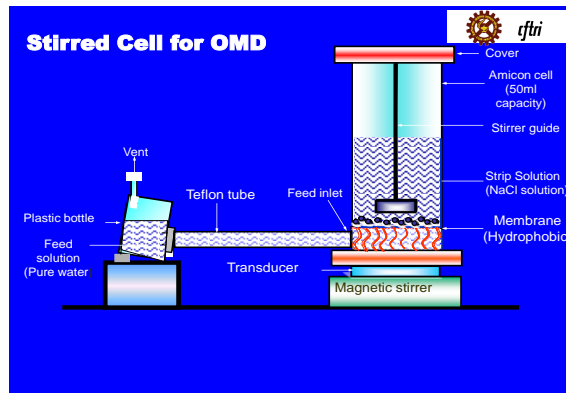


- Heat transfer**
 - Conduction, Convection & Radiation
- Mass transfer**
 - Diffusion & Mass transfer across phase
- Momentum transfer**
 - Viscosity, fluid flow/hydrodynamics
- Simultaneous and interdependent**
 - Sugar in a glass of water
 - Heating a liquid with and without mixing.

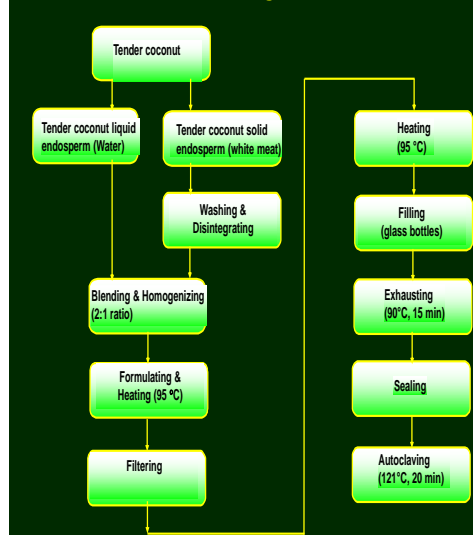
Transport Phenomena in Food Process Engineering



- Heat transfer**
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Tender Coconut Beverage



Design and development of grating machine for coconut



Front view



Side view

Coconut grating machine



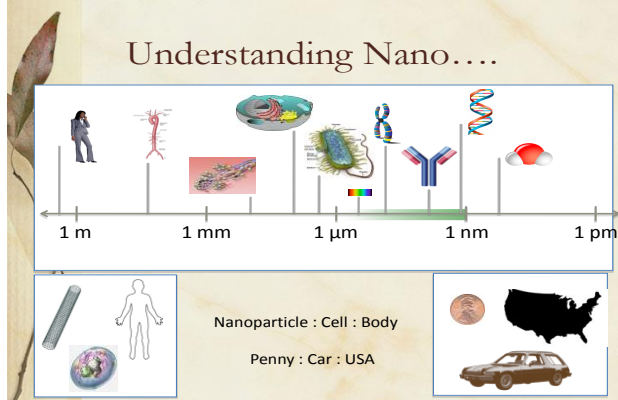
Pared Coconut before grating



Coconut after grating

a) Pared coconut before grating; b) Coconut after grating

INTRODUCTION TO NANOSCIENCE AND TECHNOLOGY AND THEIR DIVERSE APPLICATIONS
BY
T N V K V PRASAD



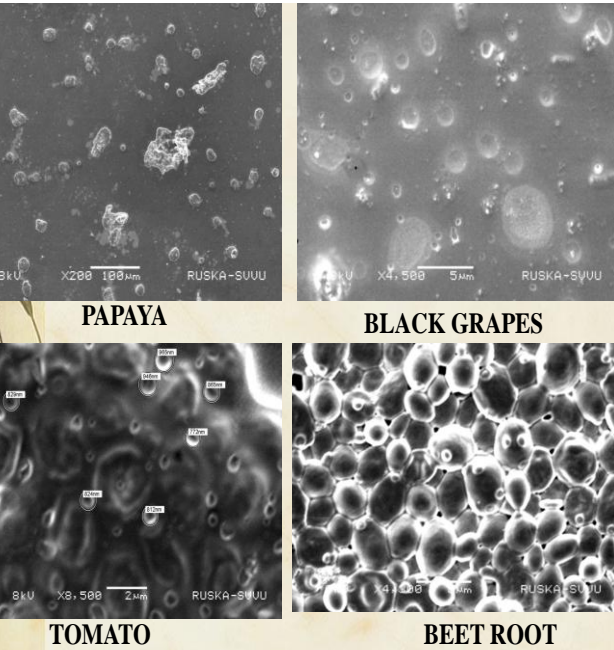
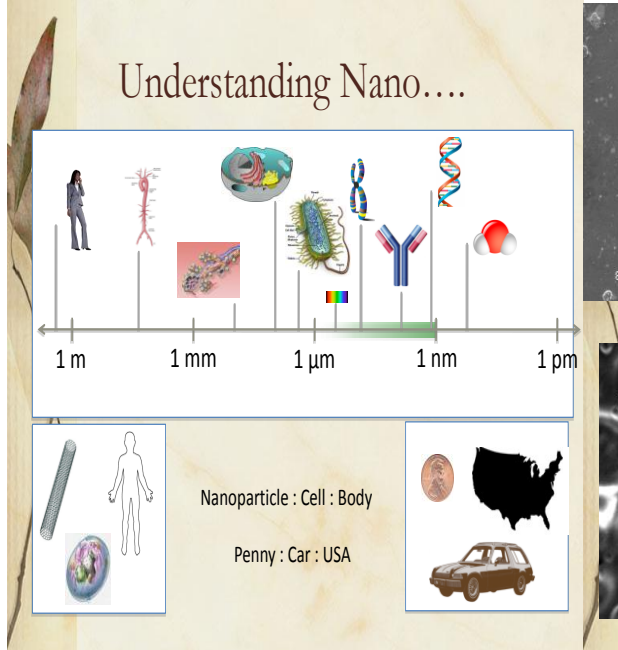
What is Nano?

Nano is from Greek word 'Nanos' meaning Dwarf. It is a prefix used to describe "one billionth" of Something, or 0.000000001.

10 ⁻⁶	1 Meter
10 ⁻¹	10 Centimeters
10 ⁻²	1 Centimeter
10 ⁻³	1 Millimeter
10 ⁻⁴	100 Microns
10 ⁻⁵	10 Microns
10 ⁻⁶	1 Micron
10 ⁻⁷	1,000 Angstroms
10 ⁻⁸	100 Angstroms
10 ⁻⁹	1 Nanometer
10 ⁻¹⁰	1 Angstrom
10 ⁻¹¹	10 Pico meters
10 ⁻¹²	1 Pico meter
10 ⁻¹³	100 Fermis
10 ⁻¹⁴	10 Fermis
10 ⁻¹⁵	1 Fermi
10 ⁻¹⁶	0.1 Fermis
10 ⁻¹⁷	0.01 Fermis
10 ⁻¹⁸	0.001 Fermis

- ### Effect of nanoscale ZnO on maize
1. The work presented in the manuscript is the first report on field scale evaluation of nanoscale zinc oxide particulates on maize crop.
 2. Nanoparticle concentration dependent translocation and accumulation of zinc has been observed which is an anticipated property of nanoscale materials in biological systems due to the quantum confinement.
 3. Our work points to the possibilities of cultivating designer agricultural produce with the required levels of bio-fortified nutrients with the application of nanoscale materials as nutrients and as effective delivery systems for nutrient delivery in to the plants.
 4. The nanoscale ZnO particulates used in this study are of specific kind which pose less/ non-toxic effects and designed for the agricultural applications only.

- ### Indian Mythological perspective....
- Lotus leaf and Lakshmi, Saraswathi and Lord Vishnu.
 - Peacock and Swan with nanoparticles in feathers.
 - Tippu Sultan sword and Ajanta paintings—Engineered Nanoparticles



DEVELOPMENT OF ENTREPRENEURIAL SKILLS BY DR MAHALAKSHMI V REDDY

ENTREPRENEURSHIP

A purposeful activity to initiate and develop a profit oriented business

ENTREPRENEUR

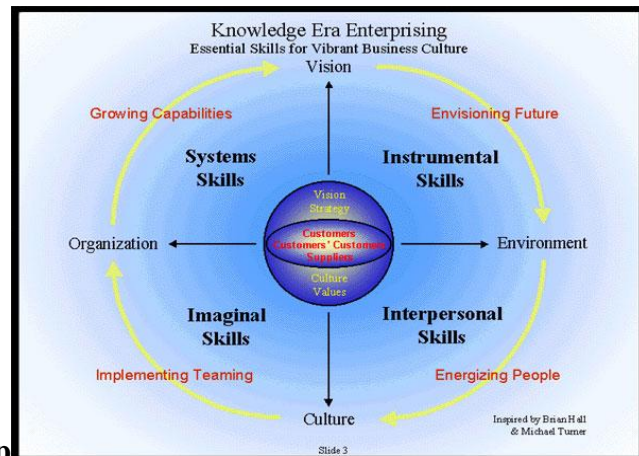
- Generally, any person starting a new project or trying a new opportunity.
- An entrepreneur is an individual who accepts financial risks and undertakes new financial ventures.
- Some one who initiates and actively operates an entrepreneurial venture
- One who always searches for change, responds to it and exploits it as an opportunity

What are the Entrepreneurial Characteristics, skills...



Driving force to build confidence and self-esteem of young people

Personal Qualities of Successful Entrepreneurs



Practical Skills

- Goal Setting,
- Planning and Organizing.
management skills
organization skills
financial forecasts
- Decision Making,

•Knowledge

- Business knowledge.
- Entrepreneurial knowledge.
- Opportunity-specific knowledge.
- Venture-specific knowledge.

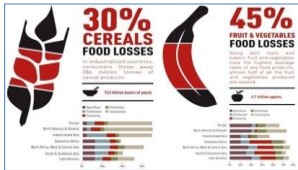
How to Develop or Improve your Entrepreneurial Skills

- 1.Start a small business-mistakes can be made & corrected
2. Read business, industrial and technological magazines
3. Read books on business and entrepreneurship
4. Attend seminars
5. Read autobiographies and biographies of successful entrepreneurs
6. Join organizations to gain entrepreneurial skills - communication skills, people skills, leadership skills, negotiation skills and so on
7. Network with other entrepreneurs



RECENT ADVANCES IN PACKAGING FOR FOOD PROCESSING BUSINESS
BY
MR. B K KARNA

FAO report on food losses



Losses due to poor Storage, Transit, Handling

Explore the Packaging for these losses



Our Experiment towards replacement of EPS Box



CURRENT TRENDS AND DEVELOPMENTS

BULK PACKAGING - CURRENT TRENDS



CORRUGATED FIBREBOARD BOX



PLASTIC CRATE



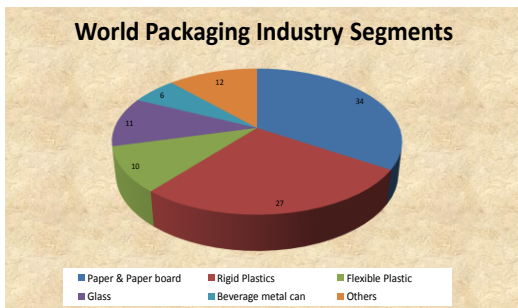
PLASTIC WOVEN SACK

Dissolvable Fruitwash Labels



It's based on the oval or circular peel-off labels fixed to the skins of fruits, however the labels essentially dissolve into an organic soap mixture which can then be used as a cleaning product, partly aiding in the removal of substances from the fruit or vegetable's

Global Packaging Market, by type -- 2012



<http://www.companiesandmarkets.com/MarketInsight/Paper-and-Packaging/Global-Packaging-Industry/NI7323>

CURRENT TRENDS AND DEVELOPMENTS

CONSUMER PACKAGING MATERIALS

TRAYS (EPS, MOULDED PULP, CFB)



PLASTIC PUNNETS



BAKERY PROCESSING TECHNOLOGIES FOR DEVELOPMENT OF AN ENTERPRISE

BY

DR V VIJAYA LAKSHMI

Bakery Industry in India

The largest of the food industries with an annual turnover of about 700 million US\$

The second largest producer of biscuits after USA.

The biscuit industry comprises of organized and unorganised sectors.

Bread and biscuits most popular - 80% of total bakery products produced in the country.

Mainly concentrated in the States of Maharashtra, West Bengal, Andhra Pradesh, Karnataka and Uttar Pradesh.

The per capita consumption is very high in States like Maharashtra and West Bengal.

Development Commissioner (MSME) Ministry of Micro , Small and Medium Enterprises .
Government of India.

Consumer Demographics :

With a population of 1.2billion, India is the world's second most populous country .

India is also one of the youngest countries in the world with a median age of 25. Nearly 60 percent of Indians are under the age of 30.

However , declining birth rates suggest that the Indian population will age over the next 10 years with the fastest growth occurring among those aged 30 and above, a group that comprises the highest earners.

Nearly half of all Indians are married and families traditionally live in joint or extended families resulting in an average household size of 4.9 people in 2012.

In urban areas, smaller nuclear families are becoming more common as mobility and employment opportunities increase.



How to Start a Bakery



Bakery knowledge and experience is needed to start a successful bakery



With over 100 bakery projects executed worldwide, Bakery Initiatives is the leading global solution provider for the bakery segment.



Depending on your specific needs and investment capacity, Bakery Initiatives offers various bakery consultancy services, but can also offer Turnkey bakery solutions.



A Turnkey bakery solution means from bakery business plan to bakery commissioning and bakery training to a fully operating profitable bakery.

Bakery Concepts for small scale start-ups

FOR ENTREPRENEURS WHO WANT TO START ON A SMALL SCALE, BAKERY INITIATIVES OFFERS 2 TYPES OF CONCEPTS.



1 lakh Turnkey Bakery Solution (e.g.;150 kg/hour of tin bread of 800 gram)

5lakh Turnkey Bakery Solution (e.g.;750 kg/hour of tin bread of 800 gram)

Reaching the customer

There are several different types of retail establishments within the bakery industry.

These include retail in-store bakeries, specialty bakeries and retail standalone bakeries.

Retail in-store bakeries are defined as those located within larger retail establishment such as a grocery store, mass merchandiser or wholesale club store.

They offer an assortment of bakery products such as breads, cakes, pies, bagels, cookies, donuts, and muffins.

Conclusion

There is scope for bakery products as a means of improving micronutrients of the needy population.

Due importance should be given with respect to the food habits of the population, resources available in the region and the new technologies.

Multiple micronutrient deficiencies can be addressed.

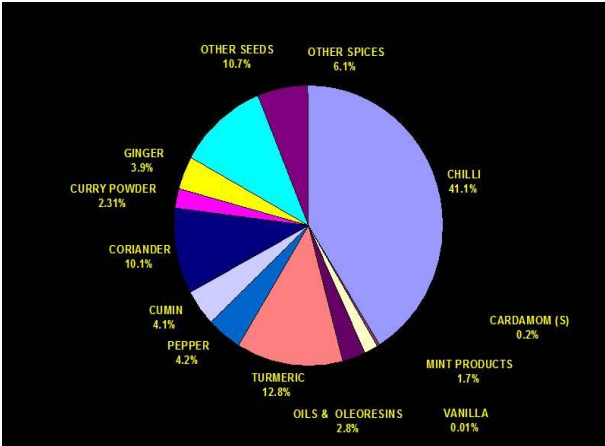
The challenge is to create evidence for the public health impact of fortification of bakery products.

Implementation of such new initiative should complement the existing strategies in the region.

ADVANCES IN SPICE PROCESSING TECHNOLOGIES

BY
A. POSHADRI

MAJOR PRODUCT SEGMENTS IN EXPORTS OF SPICES



Scope and importance

- India has diverse soil and climate & several agro-ecological regions which provides the opportunity to grow a variety of spice crops.
- It is low volume and high value crop.
- spice crops play a unique role in India's economy by improving the income of the rural people
- Labor intensive so generate lot of employment opportunities for the rural population.
- The demand of Indian spice is very much in other countries . Hence we have very much scope to meet that demand by huge production.



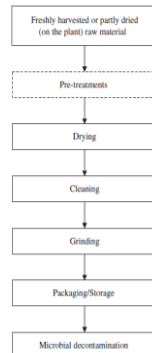
Product	Product Code	Spice Equivalency
Black pepper	PEP1006	1Kg replaces 20Kg raw spice
Paprika	PAP1010	1Kg replaces 70Kg raw spice
Capsicum	CAP1006	1Kg replaces 70Kg raw spice
Ginger	GIN1006	1Kg replaces 40Kg raw spice
Nutmeg	NUT1001	1Kg replaces 20Kg raw spice
Cardamom	CAR1001	1Kg replaces 50Kg raw spice
Cassia	CAS1009	1Kg replaces 40Kg raw spice
Celery	CEL1002	1Kg replaces 10Kg raw spice
Clove	CLV1001	1Kg replaces 10Kg raw spice
Cumin	CUM1001	1Kg replaces 20Kg raw spice
Coriander	COR1001	1Kg replaces 20Kg raw spice
Fenugreek	FEN1001	1Kg replaces 10Kg raw spice
Garlic	GLC1001	1Kg replaces 20Kg raw spice

Conclusion

- Wide variety of flavours and food ingredients can be produced
- Innovative processes may pivotally contribute to HACCP concepts in the food industry.
- Decrease the number of food-borne diseases caused by spices and thus to ensure food safety.
- Success of new processes and products will ultimately depend on their consumer acceptance

Spices in Five Categories

- **Major spices**:-Black pepper, Cardamoms, Chillies, Ginger and Turmeric
- **Seed spices**:-coriander, celery, fennel, Cumin
- **Tree spices**:- clove, nutmeg, kokum
- **Herbal spices**:- thyme, marjoram
- **Misc spices**:- garlic, saffron, pepper long



Conventional process for the production of spices (steps in dotted lines are optional).



POST HARVEST PROCESSING OF FRUITS AND VEGETABLES FOR VALUE ADDITION

**BY
DR. J DILIP BABU**

National Priorities are:

Ensuring our domestic food security by way of :

- ❖ Prevention of losses
- ❖ Processing to preserve
- ❖ Development of distribution
- ❖ Process to export

The exports are necessary to

- ❖ Assist farmers
- ❖ Promote trade
- ❖ Earn foreign exchange
- ❖ Generate employment for rural youth

The average size of top 20 food product companies in various countries :

- USA : 42,500 Crores
- UK : 14,500 Crores
- Malaysia : 2,100 Crores
- India : 513 Crores

Strengths of India

- Indian food products are popular
- India has the naturally available strengths to be effective world leader in processed food products.

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CHALLENGE for processing & value addition

- **Maintain a viable and state-of-the-art agricultural production and food processing technology system.**
- **Develop foods that are tasteful, meet nutrient requirements and promote optimal health.**
 - Use appropriate and novel technologies

Scope of Food Irradiation in India

- India loses around 37% of its agricultural produce every year due to absence of proper infrastructure facilities resulting in estimated loss of around Rs.50,000 crores annually
- Significant amount of agricultural produce is destroyed in our country during harvesting, storage and transportation
- It is envisaged that adoption of new technologies would bring down the losses to around 1%
- In general, such post-harvest losses are estimated to be around 10% in food grains and 25 to 40 % in fruits and vegetables.

UTILIZATION OF UNDER UTILISED FOODS

BY

DR K UMA MAHESWARI

IMPORTANCE

- Important role in the subsistence and economy of poor people
- Dietary diversification
- Micronutrients such as vitamins and minerals
- Commercial purpose
- Environmentally friendly - as they are adapted to
 - Marginal soil and
 - Climate conditions.

UNDER UTILISED FOODS

- Just three crops – Maize, Wheat and Rice - account for about 50% of the world's consumption of calories and protein
- About 95% of the world's food needs are provided for by just 30 species of plants
- Neglected and underutilized plants are those that could be - and, in many cases, historically have been - used for food and other uses on a larger scale
- Such crop species have also been described as "minor", "orphan", "promising" and "little-used"



Introduction

- The varying weather conditions in India provide suitable environment for growing a variety of underutilized foods
- Most of the underutilized foods are often available only in the local markets and are practically unknown in other parts of the world

Nutritional Benefits of Cassia Tora seeds

- Family Leguminosae
- It is an annual herb occurring as wasteland rainy season weed
- Shape of the seeds is irregular rectangular resembling fenugreek seeds
- Raw seeds of Cassia tora contain about
 - Crude protein – 15.0%
 - Crude fat – 1.0%
 - Crude fiber – 4.0%
 - Carbohydrates – 71.0%
- The seeds also contain - phytic acid, trypsin inhibitors and tannins.
- Incorporation of Cassia tora seeds in the diets resulted in a decrease in blood cholesterol levels.
- The products like coffee, chutney, missi roti, rice flour chilla, bread pakora, parantha prepared with Cassia tora seeds powder were found acceptable as per the organoleptic evaluation carried

Health Benefits of Cassia Tora seeds

- ❖ Used as a coffee substitute
- ❖ Acts as a nerve tonic
- ❖ Decoction - treatment of fever
- ❖ Treating skin diseases like ringworm and itching or body scratch and psoriasis, eczema and dermatomycosis
- ❖ Cassia Tora acts as a liver stimulant, mild laxative and heart tonic
- ❖ Helps in maintaining the normal level of cholesterol
- ❖ Treating piles
- ❖ Its powder proves useful in combating indigestion, toning up heart muscles and purifying blood
- ❖ Skin ailments, rashes and allergies
- ❖ It is also used as an antidote in case of various poisonings
- ❖ The leaves and seeds of Cassia Tora are useful in leprosy, flatulence, colic, dyspepsia, constipation, cough, bronchitis and cardiac disorders

NATURAL FOOD COLOURS - UNDER UTILISED FOODS

- India is a biodiversity country, where there are plenty of plant foods available at low cost and underutilized, which are rich in micronutrients and contain pigments such as Carotenoids, chlorophylls, betalains, Anthocyanins and flavones etc.
- These foods contain biologically active substances such as antioxidants and natural food colors, which do not cause any healthy problems as associated with synthetic/artificial food colors
- Natural food colors also protect foods from oxidation by enzymes.

PRO-BIOTICS - CHALLENGES FOR INCORPORATION IN FOODS

BY

PROF. K. KONDAL REDDY

Probiotics and prebiotics are two food ingredients that have physiological effects in the gastrointestinal tract.

Probiotics have been defined as live microorganisms that (when ingested) have a beneficial effect in the prevention and treatment of specific medical conditions.

Prebiotics are non-digestible food ingredients that beneficially affect host health by selectively stimulating the growth and/or activity of bacteria in the colon.

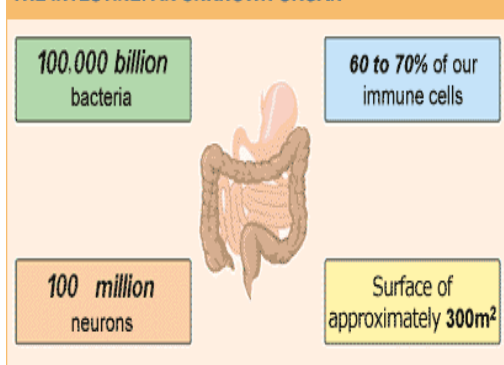
Symbiosis

Combining probiotics and prebiotics in what has been called a synbiotic could beneficially affect the host by improving survival and implantation of live probiotic microbial dietary supplements in the gastrointestinal flora, by selectively stimulating the growth

The prebiotic oligosaccharides are found naturally in many foods, such as wheat, onions, bananas, honey, garlic, or leeks.

Also isolated from chicory root (inulin) or synthesized enzymatically from sucrose.

THE INTESTINE: AN UNKNOWN ORGAN



Bifidobacteria

Bifidobacterium bifidum

- B adolescentis
- B animalis
- B infantis
- B longum
- B thermophilum

Gram positive cocci

- Lactococcus lactis subsp cremoris
- Streptococcus salivarius subsp thermophilus
- Enterococcus faecium
- S diacetylactis
- S intermedius

Yeasts

- Saccharomyces boulardii
- S cerevisiae

**SOLAR DRYER NTEGRATED WITH FOOD PROCESSING TECHNOLOGIES FOR
WOMEN EMPOWERMENT
BY
MR. RAMAKRISHNA RAO**

SEED

SOCIETY FOR ENERGY, ENVIRONMENT & DEVELOPMENT
(ESTD.1987, Regd. No. 978 of 1987)

- A Non-profit Voluntary, R & D based Organization
- Started by reputed Scientists, Engineers, Professionals and Educationists in India.
- Science & Technology based NGO.

SEED

OUR THRUST AREAS

GREEN ENERGY APPLICATIONS

SOLAR FOOD PROCESSING TECHNOLOGY

RURAL EMPLOYMENT GENERATION



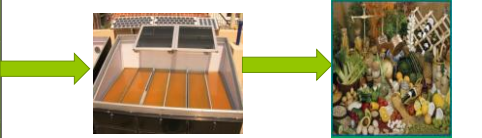

SEED

WHAT SOLAR FOOD PROCESSING TECHNOLOGY OFFERS

- Hygienic, clean and safety dehydrated products
- Manufactured with zero energy cost
- Highly nutritive fruits and vegetables
- Value addition to fruits and vegetables
- Low capital investment
- High income opportunities to farmers
- Prevents pollution free and ecologically friendly environment during the processing
- Micro level, small scale production machinery

SEED

**ANOTHER NOVEL INNOVATION
SOLAR DRYER
&
FOOD PROCESSING INTEGRATION**



SEED

**NABARD RURAL INNOVATION AWARD - 2012 FOR
SOLAR FOOD PROCESSING AND DRYER
TECHNOLOGY**



VALUE ADDED FERMENTED AND NON-FERMENTED NUTRI BEVERAGES FOR TRADING

BY
DR. KAVITHA WAGHRAY

Nonalcoholic Beverages

- Chosen for refreshment purposes
 - > To quench people's thirst
- Increased market focus on health and wellness
 - > Nonalcoholic beverages will continue to be the segment leader in beverages
 - > nutritional beverages enjoyed by people of all ages, cultures and class.

Hot Beverages

- However, coffee, tea, cacao, and other stimulant-containing beverages are extremely popular and widely consumed.
- Tea and coffee are consumed daily by at least 1/3 of the world's population.
- Many of the beverages we drink contain caffeine. These give the consumer a general feeling of well being. One of these beverages is consumed by most people in the world on a daily basis.

Waters

Main types of bottled water

- **Natural mineral water:** (NMW) is a statutory name for a specific type of water. A NMW must be officially recognized through a local authority after a qualifying period of two years, during which time it is repeatedly analysed. It must also be registered with the Food Standards Agency. It must come from a specified ground water source, which is protected from all kinds of pollution. The water may be treated in any way to alter its original chemical and microbiological composition. In addition NMWs must provide certain information on their labels such as the typical mineral analysis.
- **Spring water:** (SW) is a statutory name for water, which comes from a single non-polluted ground water source. Unlike NMW there is no formal recognition process required although it must still be registered with the local authority. Many NMWs begin their lives as Spring Waters trading as such during the two-year testing period. Unlike NMWs, Spring Waters may undergo permitted treatments but like NMWs must meet microbiological criteria. All Spring Waters must comply with the Drinking Water Regulations.
- **Table water:** (TW) may come from more than one source and may include the public water supply. Treatment is permitted which results in the water achieving the compositional/microbiological requirements of the regulations. Some companies may also add mineral salts to their waters to replace those minerals lost during treatments or to enhance those, which already exist.

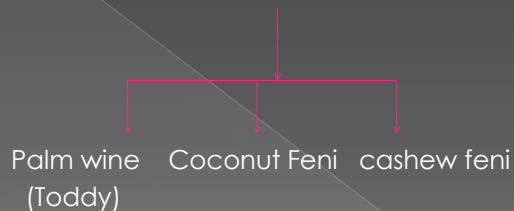
Soft Beverages

Flavored Milks , Soy Milk, Peanut Milk, Whey Juices, Sherbats, Squashes, Cordial, Barely Water, Coconut Water, Sago Water, Packaged Drinking Water, Fortified Water, Fruit Punch, Crushes, Pulp Orange, Frooty, Pulp Mango, Lemon Juice, Rhupsa, Mocktail, Nector, Carrot Juice, Beetroot Juice, Tomato Juice,

HERBAL DRINKS

Wheat Grass Juice
Panchratna Juice
Adusi + Haldi + Adarak + Tulsi Juice
Haldi + Amla + Tulsi Juice
Amla + Carrot Juice
Whey based banana herbal juice
Aloevera juice
Aloevera juice with mint and ginger
Aloe gel papaya beverage blend

Plant sap based beverages



DIVERSIFIED USES OF OILSEED CROPS

BY DR. H. BASSAPPA

Requirement of oilseeds in India

Category	2011-12	2020	2030	2050
Production of oilseeds (m.t)	26.31	67.37	71.45	82.06
Oil recovery (m.t)	9.02	20.21	23.58	28.72
Population expected(billion)	1.17	1.32	1.43	1.68
Percapita oil consumption (Kg/annum)	13.80	16.43	17.53	19.16

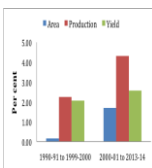
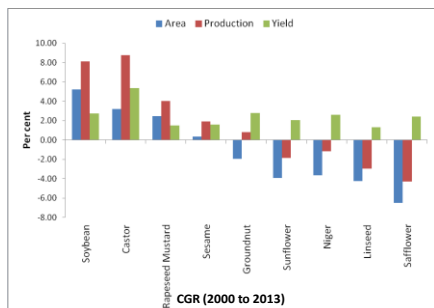
Export of DOC, seeds, oil (2012-13)

Commodities	Quantity (lakh tonnes)	Value (Rs. In Crore)
De-oiled meals	65.78	16519.53
HPS groundnut	5.36	4065.36
Sesame	3.00	2880.85
Niger	0.18	90.13
Castor oil	5.66	4309.82
Others	0.28	287.29
Grand total	80.26	28152.98

DO meals -58%, HPS groundnut-14%, Castor oil-15%
Sesame-10%



Compound growth rates of annual oilseed crops in India



Compound growth rates of annual oilseed crops in India

Humanize Cow and Buffalo Milk: Fortify with Omega-3

- Enriching milk with vegetarian omega-3, in a country like India with over 70 % people who are vegetarian is best means of attaining omega-3 nutritional security.
- The fact that we resource omega-3-fatty acid from linseed oil that has four times omega-3 more than omega-6, has advantage of tilting the imbalance of omega-6 to omega-3 ratio to a healthy status.
- The fact that we are resourcing omega-3 from linseed oil i.e. naturally rich in omega-3 makes it more suitable than resourcing from non-vegetarian sources.
- The enriching milk with fish oil has disadvantage that it is non-vegetarian and can be totally unpalatable because of its awful smell and also may not be safe because of its possible mercury contamination.



Groundnut Production in India

Area (season wise) : Kharif : 6.30 m.ha.
Rabi/Summer : 0.83 m.ha.
Seed requirement : Kharif : 1.00 m.t.
Rabi/Summer : 1.25 lac.t.



Test marketed omega-3 products under ICAR-NAIP Project



Omega-3 Biscuits Omega-3 soft gel capsules Omega-3 Oil



Flax lignan (offing) Omega-3 Chicken (Offing) Omega-3 egg

All seed supply system are accounting 12% of total requirement.

Unorganized seed is sown in 88% of area.

Existing seed chain :

Farmer → Trader → Farmer and
Farmer → Farmer



**SUPPORT FROM BANKS FOR SME SECTOR
BY
DR KOTESWARA RAO**

Food processing sector is classified under priority sector by Reserve Bank of India. They come under the category of Micro, small and Medium Enterprises. The classification is based on the investment in plant & Machinery and Equipment (original cost excluding the land and building) for each types of unit

These will include, small business, retail trade, professional and self employed persons and other service enterprise including food processing activities.
Lending by Bank to micro & small enterprises are included under priority sector lending.

Classification

Size/Type	Manufacturing Enterprise (ME) Investment Plant & Machinery	Service Enterprise (Investment in equipment)
Micro	Not exceeding 25 lakhs	Not exceeding Rs.10.00 lakhs
Small	Rs.25.00 lakhs upto Rs.5.00 crore	Rs.10 lakhs & up to Rs.2.00 crore
Medium	Rs.5.00 crore & upto Rs.10.00 crore	Rs.2.00 crore & up to Rs.5.00 crore

Facilities

1. Term Loans
2. Working capital
3. Bank Guarantees
4. Differed Payment Guarantee
5. Letters of credit

Maximum permissible Bank Finance Method

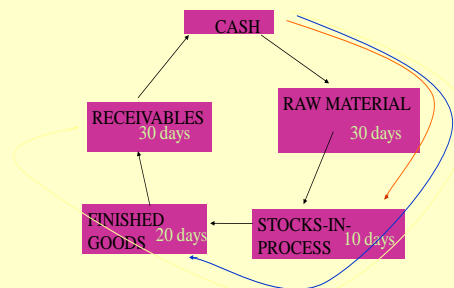
Under this method, after careful examination of various aspects, the permissible bank finance is arrived as under:

- 1) Current assets
- 2) Less : Current liabilities other than Bank borrowings
- 3) Working Capital gap
- 4) Minimum net working capital (25% of 1)
- 5) Actual or projected net working capital
- 6) Permissible Bank Finance (3-4)
- 7) Permissible bank Finance (3-5)
- 8) Bank Finance available : (3-4) or (3-5) whichever is lower

Prima facie acceptability

- Bank's lending policy / RBI Guidelines
- Industry Exposure norms
- Credit Risk Rating norms
- RBI Defaulter's List
- ECGC Specific Approval List
- Government regulations
- MA in respect of cos., to know the scope of activity and borrowing powers
- AA in respect of cos., to know authorised signatories; no prejudicial clauses
- Project cost
- Proposed Debt / Equity
- Profitability, etc.

OPERATING CYCLE Eg:



Length of Operating Cycle = 90 days i.e. 4 Cycles per year

REGULATORY REQUIREMENTS OF FOOD BUSINESS
BY
DR. V. SUDERSHAN RAO

Major Act
Prevention of Food Adulteration Act

Others FPO
 MMPO
 MFPO
 VOP
 SEODE
 Edible Flour
 Edible oil Packaging Act

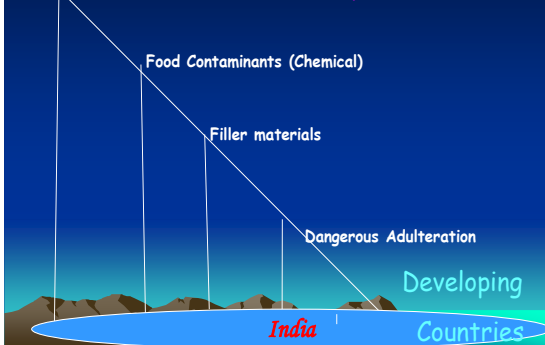
Controlled by 8 ministries

Prevention of Food Adulteration Act, 1954 *
Basic Food Safety Act :

Food standards
 General procedures for sampling
 Analysis of food, powers of authorized officers,
 Nature of penalties and other parameters related
 to food
 Food additives, preservatives, colouring matters
 Packing & labeling of foods,
 Prohibition & regulations of sales etc.

Changing Profile of Food Adulteration & Contamination

Food Contaminants (Microbiological) **Developed Countries**



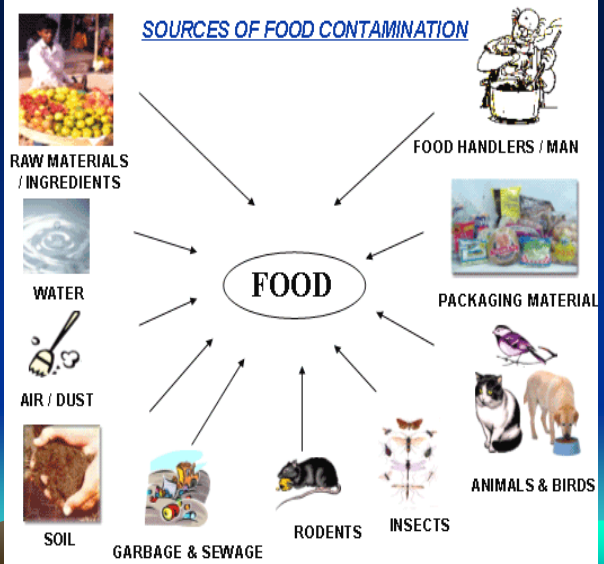
Chapter iv sec. 22

Genetically modified foods, organic foods and proprietary foods

Proprietary and novel food means an article of food which standards have not been specified but **it is not unsafe**
Provided that such food does not contain any of the foods or ingredients prohibited under this act

Establishment of Scientific panels

1. Food additives, flavouring agents, processing aids, material in contact with food
2. Pesticide residues and antibiotic residues
3. GMOs and foods
4. Functional foods, nutraceuticals, dietetic products
5. Biological hazards
6. Contaminants in the food chain
7. Labelling
8. Method of sampling and analysis



ADVANCES IN MANAGEMENT OF LIVESTOCK FEEDS FOR IMPROVEMENT YIELD AND QUALITY OF LIVESTOCK PRODUCTS

BY
DR.PRASANNA KUMAR REPALLE

Livestock Population in India (19th Census, 2012)

Category	In Million	Stands
Cattle	190.1	2 nd
Buffalo	108.9	1 st
Sheep	65.8	3 rd
Goat	135.2	2 nd
Pigs	10.2	>10 th
Poultry	729.2	5 th
Fish	82.90	2 nd

Livestock Products (2012)

Products	India (MT)	World (MT)	India ranks
	2012-2013	2012-2013	2012-2013
Milk	132.4	750.1	First
Meat	5.9	220.1	Fifth
Egg	17.8	65.0	Third
Fish	4.95	157	Second

Anti oxidants

Natural

- Tocopherols (Vit E)
- Ascorbic Acid (Vit C)
- Glutathione
- Polyphenols (Flavonoida) etc.,

Synthetic

- Butylated hydroxyanisole (BHA)
- Butylated Hydroxytoluene (BHT)
- Tertiary Butylhydroquinone (TBHQ)
- Propyl Gallate
- Ethoxyquin etc.,

Organic Animal Rearing

- At present, emphasis on consumption of organic foods is increasing
- Few research findings says that meat from organically reared animals contains different fatty acid composition than the animals reared under conventional systems.
- The organic meat had a higher polyunsaturated fatty acid content and better eating quality in terms of juiciness and flavor than conventional meat. (Angood et al., 2008)
- Organically produced meat is reported to contain higher amounts total PUFAs and Omega-3 Fats
- Still research is yet to be done to confirm the beneficial effects of Organic meat

Resources

Product	Source	Contribution (%)
Milk	Cattle (Indigenous)	26
	Cattle(Exotic)	12
	Buffalo	31
	Goat	31
Meat	Cattle	31
	Buffalo	33
	Sheep	5
	Goat	10
	Swine	10
	Poultry	11
Eggs	Chicken Fowl	95
	Duck	3
	Turkey & Others	2

Cultivation of Fodders-Hydroponic (Less Space, & 70% less water, 30% save in fertilizers)



POST HARVEST MANAGEMENT IN FIELD CROPS

BY
DR. N V NAIDU

TIME OF HARVESTING – WHEN & WHY ???

IMPORTANCE OF SEED

Seed is recognized as key input for sustainable agriculture and the chemical fertilizers, irrigation, pesticides and other inputs are able to give higher returns when good quality seed are sown.

Experimental data has revealed that the quality/pure seed alone can increase the yields by 20 to 30%.

- It is of great importance to harvest seed crop at a time that will allow maximum yields, best quality, easy harvest, threshing and seed conditioning resulting in minimum pre and post harvest losses for realizing higher prices.
- Late and early harvesting of seed crop make combining difficulties and relative losses resulting in poor seed quality and decline of prices.

Seed Film Coating

Process of applying agro-chemicals directly onto seed or pellets, offering both aesthetic and environmental benefits



Benefits

- Precise and even distribution
- Crop protection
- Higher visibility in the field
- Product identification
- Increased shelf life
- Reduction in dust exposure



BENEFITS OF SEED FILMCOATING

Technical Benefits

- Accurate and controlled dosage of pesticides/fungicide with high level of precision.
- No dust formation in coated seeds so easy to handle while packing, storage & transport.
- Slow release of applied molecule enhances protection level to germinating seedlings.
- Safe for operator in applying all unsafe chemicals for human beings due to seeds.
- Growth Hormones, micronutrients, herbicide antidotes, biological organism and seed protectants is possible to bind with seed in precise and at accurate dosages.

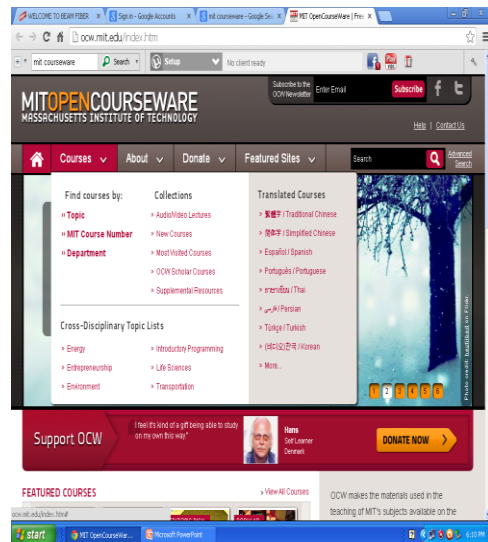
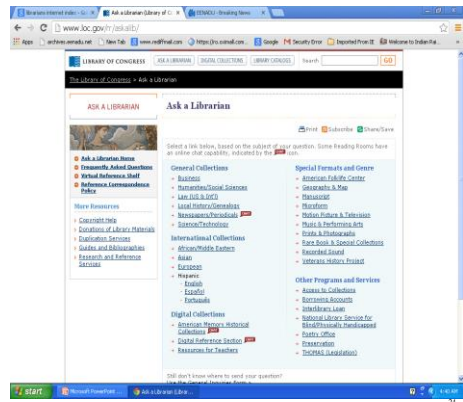
IMPORTANCE OF POLYMER COATING OF SEEDS

- The Polymers are naturally occurring water soluble cellulose as a main ingredient. It also contains dispersing agent for easy coating and drying agent for drying and binding. Polymers are non toxic to seed and human beings who are handling the polymer coating work.
- Polymer seed coating is basically done for vegetables to bind the valuable chemicals that are on the seed coat to improve physical appearance and to get cosmetic look. Due to polymer coating the chemical dust will not emit and environmental pollution can be avoided.

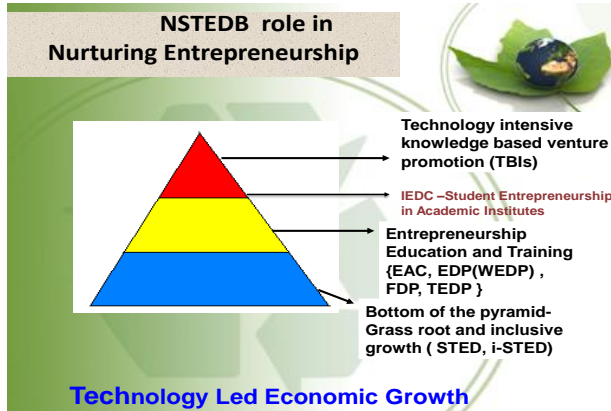
Anti-Nutritional Compounds in Pulses

- Many compounds present in pulses have antinutritional effect
- Protease inhibitors – inhibit proteolytic activity of certain enzymes – Trypsin and chymotrypsin inhibitors
- Lectins – proteinaceous toxic compounds – found in some of the beans – phytohemagglutinin
- Polyphenols – Tannins. They form complexes with protein and responsible for low protein digestability, decreased amino acid availability
- Pigeonpea, urdbean and pea have high tannins content-light coloured seeds – low tannin content
- Saponins – secondary metabolites. They are beneficial in lowering blood cholesterol

OPEN ACCESS RESOURCES BY DR. K. VEERANJANEYULU



WRITING A WINNING GRANT PROPOSAL FOR PROJECTS TO ESTABLISH A NEW ENTERPRISE BY DR USHA DIXIT



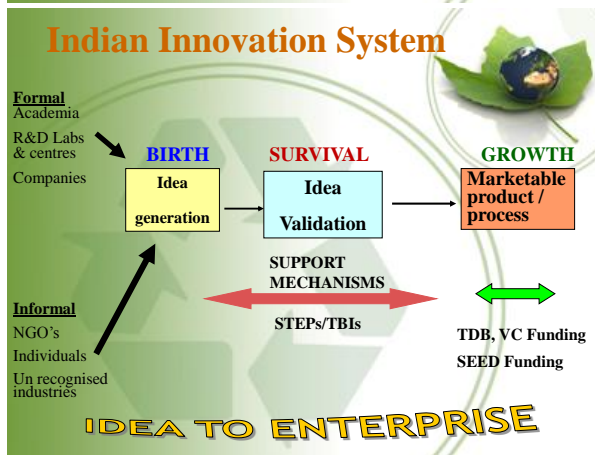
An Indian Company in Global market : Case of revitalizing local economy

16 January 2012 Issue

ROHITH BHAT, NITK-STEP, SURATHKAL PROMOTED ENTREPRENEUR

- UDUPI based
- ROBOSOFT Technologies, Employment to 400 + Engineers,
- 1500 INDIRECT EMPLOYMENT
- Rs. 100 cr. Turnover

CLIENTS: Content Developer for Apple, Samsung, CNN-IBN, NDTV, Times of India



Women Entrepreneur

- Government of India has defined women entrepreneurs as owning and controlling an enterprise with a woman having a minimum financial interest of 51% of the capital and giving atleast 51% of the employment generated in the enterprise to women.
- “Women who innovate initiate or adopt business actively are called women entrepreneurs.”
J. Schumpeter
- “Women entrepreneurship is based on women participation in equity and employment of a business enterprise.”
Ruhani j. alice

Status
10% of the entrepreneurs in the developing nation are women

Women Entrepreneurs in India

States	No of Units Registered	No. of Women Entrepreneurs	Percentage
Tamil Nadu	9018	2930	30.36
Uttar Pradesh	7900	3100	36.84
Kerala	5467	2135	38.91
Punjab	4791	1618	33.77
Maharashtra	4339	1394	32.12
Gujarat	3872	1538	39.72
Karnataka	3022	1026	28.84
Madhya Pradesh	2967	842	28.38
Other States & UTs	14576	4165	28.71
Total	57,452	18,946	32.82

From wikipedia.org

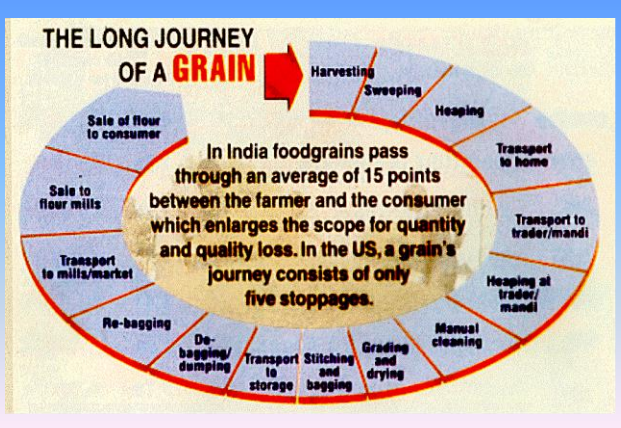
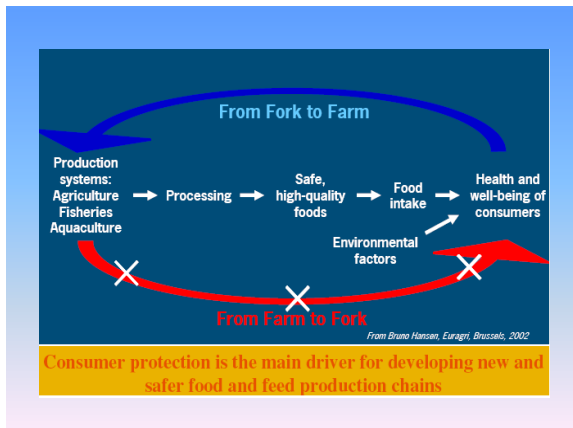
WOMEN ENTREPRENEUR IN WORLD

Country	Percentage
India (1970-1971)	14.2
India (1980-1981)	19.7
India (1990-1991)	22.3
India (2000-2011)	31.6
USA	45
UK	43
Indonesia	40
Sri Lanka	35
Brazil	35

From wikipedia.org

RADIATION PROCESSING - A TOOL FOR FOOD PROCESSING AND PRESERVATION

BY
DR. ANURAG CHATURVEDI



Food Losses

WASTEMATES	Waste in million tonne	Millions of people who could be fed for a month
TRANSPORTATION	0.38	20
MOISTURE IN STORAGE	1.38	100
BIRDS' PICKINGS	1.73	130
PROCESSING LOSSES	1.87	140
THRESHING LOSSES	3.41	250
RODENTS IN FIELD & STORAGE	5.08	380
INSECTS IN STORAGE	5.18	380
TOTAL	18.94	1480

MULTIPLYING WASTE

- LOCAL TRADER
- AGENT
- TRADER
- WHOLE SELLER
- RESELLER
- NET TOTAL

Estimates of waste for India and separate waste for quantitative and qualitative losses.



Food Preservation by Irradiation in India

Basis to fix the doses:

- Low-dose applications (less than one kGy) lead to the disinfestation of insects in stored grain, pulses and food products, and the destruction of parasites in meat and meat products
- A medium dose (one to ten kGy) eliminates microbes in fresh fruits, meat and poultry products, destroys food pathogens in meat, and helps in the hygienisation of spices and herbs
- A high dose (above 10 kGy) produces shelf-stable foods without resort to refrigeration, and the sterilisation of food for special requirements

Radiation Processing New Applications

FRUITS & VEGETABLES

- SALADS
- FRUIT JUICES
- SPROUTS
- FRESH FRUITS
- CUT VEGETABLES

CEREALS & PULSES

- SHELF-STABLE PRODUCTS
- SPROUTED PRODUCTS
- CONVENIENCE-EASY COOK
- REDUCED ANTI-NUTRITIONALS

MEAT & SEAFOOD

- AMBIENT-STABLE PRODUCTS
- READY-TO-EAT PRODUCTS

MEALS & PROCESSED FOODS

***HYTOSTEROLS AS FUNCTIONAL INGREDIENT FOR
DEVELOPMENT OF VALUE ADDED FOODS***

Aparna Kuna

***Assistant Professor, Department of Foods & Nutrition, Post Graduate & Research Centre
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ABSTRACT

Phytosterols are defined as plant sterols and plant stanols. Phytosterols lower total and LDL blood cholesterol by preventing cholesterol absorption from the intestine, so they have been known as blood cholesterol-lowering agents for over the last half century. Phytosterols are naturally found in fruits, vegetables, nuts and principally oils. Dietary phytosterol intakes normally range from 160 to 400 mg/day with variations depending on food culture and major food sources. Recent studies have shown that maximum cholesterol-lowering benefits are achieved at doses of 2-3 g per day. Therefore today's use implies the need for enriched functional food products, which give enough phytosterols intake thereby contributing to lowering LDL cholesterol levels. Dairy and other traditional Indian foods remain a choice delivery vehicle for many functional ingredients including phytosterols and there are many products available in the global markets which are enriched with phytosterols. At the current growth rate of CVD throughout India, it is expected that the Indian market demand for phytosterol fortified products in the near future. There is no doubt that phytosterol as a functional food ingredient will be a new approach to reduce LDL cholesterol through Indian traditional foods which will hold great promise for long-term health management. The use of phytosterols in commonly consumed food products may soon provide an effective tool against CVD and its introduction to Indian subcontinent is worth anticipating in the near future. Value added phytosterol rich foods are perceived as nutritious and healthy and can be easily integrated into a heart healthy diet, helping to maintain desirable cholesterol levels or providing an additional dietary option to help lower elevated cholesterol levels.

1. Introduction

Phytosterols, phytostanols and their esters are a group of steroid alcohols and esters that occur naturally in plants as non saponifiable fraction of plant oils. Phytosterols (including plant sterols and stanols) cannot be synthesized by humans, and all plant sterols and stanols in the human body therefore originate from the diet (Jong *et al.*, 2003). They are known to have several bioactive qualities with possible implications for human health (Normen *et al.*, 2002). Their properties for reducing blood cholesterol levels, as well as their other beneficial health effects, have been known for many years (Quilez *et al.*, 2003). It was recognized in the 1950s that plant sterols lower serum concentrations of cholesterol (Pollak, 1953). Plant sterols might also protect against certain types of cancer such as colon, breast and prostate (Rao and Koratkar, 1997; Awad and Fink, 2000). Scholarly reviews have all confirmed the health benefits and safety of phytosterols.

People with high blood cholesterol levels are typically advised by health professionals to exercise and consume a diet high in fiber and low in saturated fats and cholesterol. Although these measures can reduce blood cholesterol, sometimes they don't go far enough. Other cholesterol-lowering interventions may be needed, including cholesterol-lowering medicines or adding phytosterol esters to the diet (Anon., 2003). The primary phytosterols in the diet are sitosterol, stigmasterol, and campesterol and typical consumption of plant sterols is approximately 160 – 400 mg/day (Berger *et al.*, 2004). The enrichment of foods with phytosterols is one of the recent developments in functional foods to enhance the cholesterol-lowering ability of traditional food products (Anon., 2005).

2. Chemical Structures of Phytosterols

Sterols are an essential component of cell membranes, and both animals and plants produce them. They play a key role in cell membrane function. They are structurally related to cholesterol, but differ from cholesterol in the structure of the side chain (Law, 2000). Plant sterols include a wide variety of molecules that are structurally similar to cholesterol; the principal examples are 4-desmethyl sterols (Quilez *et al.*, 2003). Plant sterols are C-28 or C-29 sterols, differing from cholesterol (C-27) by the presence of an extra methyl (campesterol) or

ethyl (sitosterol) group on the cholesterol side chain (Nguyen, 1999). While over 40 plant sterols from seven different plant classes have been identified (Bean, 1973), campesterol (C-28), stigmasterol (C-29), and especially β -sitosterol (C-29) are the most abundant (Law, 2000). The terms plant sterol and phytosterol are sometimes used as generic terms to include both unsaturated sterols and saturated stanols, but they are used here to refer specifically to the unsaturated compounds. Saturated plant sterols, referred to as plant stanols have no double bond in the ring structure. Plant stanols are produced by the hydrogenation of sterols and are not abundant in nature (Law, 2000). Sitostanol and campestanol are saturated plant sterols, which are found in nature in much smaller amounts than plant sterols (Jong *et al.*, 2003). The structures of sitosterol, sitostanol, campesterol and campestanol are shown in Fig. 2. The structure of cholesterol, respectively, is shown for comparison in Fig.1.

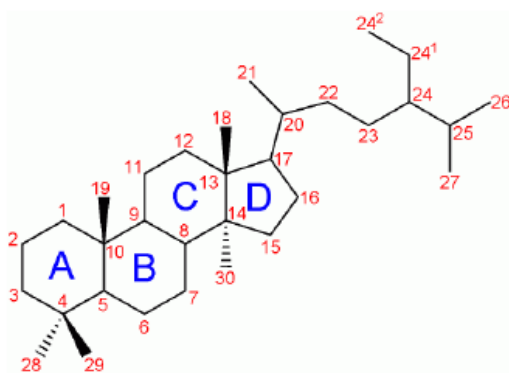


Fig.1. Steroid Skeleton

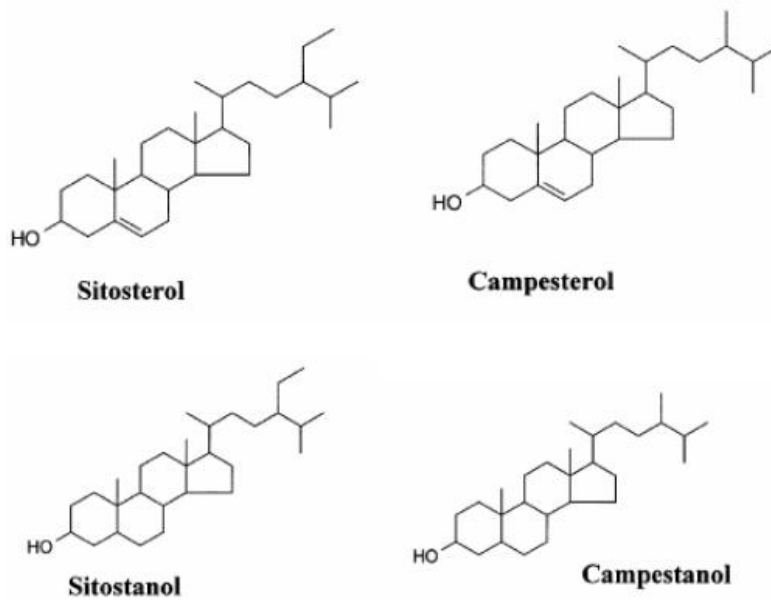


Fig.2. Molecular structure of some phytosterols and phytostanols

In foods, cholesterol occurs either as the free alcoholic sterol or as cholesteryl esters (Fenton, 1992), whereas plant sterols occur as free plant sterols, esterified plant sterols, plant steryl glycosides, and acylated plant steryl glycosides (Akihisa *et al.*, 1991). It is obvious that chemical, physical and nutritional properties of these phytosterols classes may be very different (Piironen *et al.*, 2000). The different fractions are assumed to exist in different parts of the plant cell. Free plant sterols are part of the cell wall with a structural property (Normen *et al.*, 1999). Plant steryl esters are generally believed to be storage products. They can be found in the cytosol of plant cells, in droplets or vesicles (Lorenz, 1989). The largest amount of plant steryl glycosides has been found in the microsomal fraction of the plant cell and acylated steryl glycosides are believed to exist in mitochondria (Anon., 1989).

3. Mechanism of action of phytosterols.

The exact mechanism by which phytosterols decrease serum cholesterol levels is not completely understood, but several theories have been proposed.

- One of them suggests that cholesterol in the intestine, already marginally soluble, is precipitated into a non-absorbable state in the presence of added phytosterols and stanols (Rozner and Garti, 2006).
- Another theory is based on the fact that phytosterols when consumed may reduce cholesterol absorption by competing with cholesterol for incorporation into the bile salts micelles or for up taking of cholesterol by enterocytes through Niemann Pick C1 like 1 (NPC1L1) transporter. In addition, phytosterols may enhance cholesterol excretion back into the intestinal lumen through the adenosine triphosphate binding cassette G 5 (ABCG5) and G 8 (ABCG8) transporters. Phytosterols could also prevent esterification of the free cholesterol into cholesterol esters and thus it's assembling into the chylomicrons. As a result of reducing cholesterol absorption by phytosterols, the cholesterol synthesis rate increase, but the net effect is a reduction in LDL-cholesterol levels (Jones and AbuMweis, 2009).
- Cholesterol absorption is a very important physiological mechanism that regulates cholesterol metabolism. A recent trial showed that efficacy of phytosterols is not influenced by dietary cholesterol intake in hypercholesterolemic individuals (Kassis *et al*, 2008). Both dietary cholesterol and re-circulating biliary cholesterol mix in the intestine are partially absorbed. Failure to reabsorb intestinal cholesterol is the principal means of cholesterol elimination from the body.
- Some studies show that phytosterols compete with and displace cholesterol from bile salt/phospholipid micelles, the form from which cholesterol absorption occurs. During one trial, nine adults were fed a meal containing 500mg of cholesterol and 1 g beta-sitosterol or 2 g beta-sitosteryl oleate (Mattson *et al*, 1982). The addition of betasitosterol resulted in a 42% decrease in cholesterol absorption, and the beta-sitosteryl oleate caused a 33% reduction compared to the control group, which resulted in a consequent decrease in plasma cholesterol. Sitosterol has increased affinity for biliary micelles compared with cholesterol, so sitosterol uptake by micelles is energetically favored. Further evidence of the importance of micellar solubility is the finding that the absorbability of different sterols is directly related to their equilibrium micellar concentration (Armstrong and Carey, 1987).

Unlike cholesterol, phytosterols, and to a greater extent, phytosterols are poorly absorbed and the small amount that is absorbed is actively re-excreted in bile. This results in low serum levels of these sterol molecules. The inhibition of cholesterol absorption is thought to produce a state of relative cholesterol deficiency that is followed by upregulation of cholesterol biosynthesis and LDL receptor activity (Ling and Jones, 1995). Although the exact effect on serum lipoprotein levels is not yet known, it is interesting to notice that some of the known effects of vegetable fats on lipid metabolism are compatible with known mechanisms of action for phytosterols. For example, some unsaturated vegetable oils increase hepatic LDL receptor activity, decrease LDL production, and increase LDL clearance. These actions correspond to what is anticipated from the known effect of phytosterols to reduce delivery of dietary and biliary cholesterol to the liver.

4. Dietary Sources and Intakes

Phytosterols can be found at widely varying concentrations in the fat-soluble fractions of seed, root stems, branches, leaves and blossoms. They are constituents of both edible and ornamental plants, including herbs, shrubs and trees (Clifton, 2002). As natural constituents of the human diet, phytosterols are naturally found in all food items of plant origin, principally oils and also pulses and dried fruits (Piironen *et al.*, 2000). Their content is highest in edible oils, seeds and nuts (Weihrauch and Gardner, 1978). The total contents are very variable and range from nearly 8g/kg in corn oil to 0.5g/kg in palm oil, with intermediate levels being found in commonly used oils (Philips *et al.*, 2002). Tall oil contains a higher proportion of plant stanols than do vegetable oils (Anon., 2005). The refining process in vegetable oils leads to a significant reduction in phytosterols content (Ferrari *et al.*, 1997), and it would therefore be very interesting to develop industrial methods which minimize these losses (Quilez *et al.*, 2003). Table 1 shows the total phytosterol contents of selected foods. The dietary intake of phytosterols among and within different human population varies greatly, depending on the type and amount of plant foods eaten. Although cooking oils, margarine and peanut butter are the main sources of phytosterols in the diet. Phytosterols are also consumed from seeds, nuts, cereals and legumes (Tasan *et al.*, 2006, Clifton, 2009). The consumption of phytosterols can range between 170mg/day in populations eating a Western diet and 360mg/day in diets rich in vegetable products (Vries *et al.*, 1997). The dietary intake of plant stanols is usually only about 50mg/day

unless the diet is supplemented with tall oil, which is derived from conifers and is rich in sitostanol (Gilbert *et al.*, 2005). The normal dietary intake of plant stanols is much less than that of plant sterols.

Table 1: Total phytosterols contents of selected foods (Kritchevsky, D. 1997)

Sl .No	Phytosterol food sources	Total phytosterol content (mg/100g)
OILS		
1.	Rice bran	1055
2.	Corn	952
3.	Wheat germ	553
4.	Flax seed	338
5.	Cottonseed	327
6.	Soybean	221
7.	Peanut	206
8.	Olive	176
9.	Coconut	91
10.	Palm	49
VEGETABLES		
11.	Beet root	25
12.	Brussels sprout	24

13.	Cauliflower	18
14.	Onion	15
15.	Carrot	12
16.	Cabbage	11
17.	Yam	10
FRUITS		
18.	Orange	24
19.	Banana	16
20.	Apple	12
21.	Cherry	12
22.	Peach	10
23.	Pear	8
NUTS		
24.	Cashew	158
25.	Almond	143
26.	Pecan	108
27.	Pistachio	108
28.	Walnut	108
LEGUMES		

29.	Pea	135
30.	Kidney bean	127
31.	Broad bean	124

Although people consume phytosterols every day in food, the amounts are often not great enough to have significant cholesterol lowering effect (Anon., 2003). Phytosterols can be incorporated into traditional food products. In order to achieve maximum cholesterol lowering benefit, doses of 2-3 g/day plant sterols or plant stanols need to be consumed (Isabelle *et al.*, 2009; Clifton, 2009; Abu Mweis *et al.*, 2008; Hallikainen *et al.*, 2000; Jones *et al.*, 2000; Maki *et al.*, 2001) which can be achieved by enriching the commonly consumed foods with phytosterols. Also, finding and cultivating varieties with higher phytosterol contents will increase consumption in the population (Quilez *et al.*, 2003). Genetic modification becomes a powerful tool for related purposes (Venkatramesh *et al.*, 2003).

5. *Enrichment of Indian foods with Phytosterols*

The use of foods containing phytosterols is a relatively recent development in human nutrition (Gilbert *et al.*, 2005). Phytosterols, as functional ingredients in foods, appear to be a practical and safe option for decreasing cholesterol levels in the population suffering from Coronary vascular diseases. These components are incorporated nowadays into a wide variety of food products such as yoghurt, yoghurt drinks, milk drinks, butter milk, acid milk, cream cheese, fruit bars, fruit juices and soy yoghurt drinks. To produce functional foods containing elevated levels of plant sterols and stanols is the aim of many food companies in the developed countries. New techniques have allowed the incorporation of plant sterols and stanols into food forms without affecting the texture and taste.

Dairy foods remain a choice delivery vehicle for functional ingredients such as antioxidants, fatty acids, fiber, pro-biotic, whey proteins and also phytosterols because refrigerated and freezing temperatures assist with keeping many functional ingredients active. Further, fresh dairy

foods' limited shelf life ensures that most fragile ingredients won't degrade prior to consumption. Commercially, phytosterols are currently contained in many dairy products all over the world (Table 2) (Cantrill and Kawamura, 2008, Berger *et al.*, 2004; Kritchevsky and Chen, 2005). Phytosterols, phytostanols and their esters are incorporated into a variety of dairy based foods and beverages, produced by a growing number of food and beverage manufacturers. The main dairy product formats incorporated with phytosterol esters are:

- yogurts (1.25g per 125ml)
- yogurt drinks (3.4g per 100ml)
- milk (5g per liter)

Table 2: Dairy products incorporated with phytosterols in the world market

Sl. No	Country	Dairy product	Phytostanol ester content/daily portion (equals 2g phytosterols)
1.	Austria	Yoghurt drink	3.4g / 65 ml
2.	Belgium	Cream cheese Yoghurt Yoghurt drink Soy yoghurt drink	3.4g / 50 g 3.4g / 125 ml 3.4g / 70 g 3.4g / 65 ml
3.	Chile	Milk drink	3.4g / 200 ml
4.	Ecuador	Cream cheese Milk drink Yoghurt drink	3.4g / 50 g 3.4g / 250 ml 3.4g / 120 ml
5.	Finland	Spread Cream cheese Liquid Rapeseed oil Cheese type product Frankfurters Turkey Liver Sausage Turkey Sausage Mayonnaise Salad Broiler casserole Chicken balls Pasta Yoghurt Buttermilk Yoghurt drink Milk drink Instant Oat Meal	3.4 g / 25 g 3.4 g / 40 g 3.4 g / 40 g 3.4 g / 50 g 3.4 g / 300 g 3.4 g / 60 g 3.4 g / 125 g 3.4 g / 200 g 3.4 g / 300 g 3.4 g / 234 g 3.4 g / 140 g 3.4 g / 150 g 3.4 g / 300 ml 3.4 g / 100 ml 3.4 g / 500 ml 3.4 g / 35 g

		Capsules	3.4 g / 4 capsules
6.	France	Spread Yoghurt	3.4 g / 30 g 3.4g / 250 g
7.	Germany	Yoghurt drink	3.4g / 65 ml
8.	Greece	Cream cheese	3.4g / 30 g
9.	Ice land	Yoghurt drink	3.4g / 65 ml
10.	Indonesia	Acid milk	3.4g / 100 ml
11.	Ireland	Cream cheese Milk drink Yoghurt Yoghurt drink Soy yoghurt drink	3.4g / 50 g 3.4g / 250 ml 3.4g / 125 g 3.4g / 70 g 3.4g / 65 ml
12.	Italy	Yoghurt drink	3.4g / 65 ml
13.	Netherlands	Yoghurt Yoghurt drink	3.4g / 500 g 3.4g / 500 g
14.	Luxembourg	Cream cheese Yoghurt Yoghurt drink	3.4g / 50 g 3.4g / 125 ml 3.4g / 70 g
15.	Poland	Yoghurt drink	3.4g / 100 ml
16.	Portugal	Yoghurt drink Milk drink Olive oil	3.4g / 65 ml 3.4g / 333 ml 3.4g / 45ml
17.	South Africa	Yoghurt drink	3.4g / 100 ml
18.	Spain	Yoghurt Yoghurt drink Milk drink	3.4g / 125 g 3.4g / 65 ml 3.4g / 333 ml
19.	Switzerland	Yoghurt Yoghurt drink	3.4g / 150 g 3.4g / 65 ml
20.	Turkey	Yoghurt Yoghurt drink Milk drink	3.4g / 115 g 3.4g / 100 ml 3.4g / 250 ml
21.	United Arab Emirates	Milk drink Yoghurt	3.4g / 500 ml 3.4g / 125 g
22.	UK	Spread Cream cheese Milk drink Yoghurt Yoghurt drink Orange juice Soy yoghurt drink Snack Bar	3.4 g / 30 g 3.4 g / 50 g 3.4 g / 250 ml 3.4 g / 125 g 3.4 g / 70 g 3.4 g / 500 ml 3.4 g / 65 ml 3.4 g / 50 g
23.	USA	Spread Dressing Snack Bars Candy Chews Capsules	3.4 g / 56 g 3.4 g / 30 ml 3.4 g / 62 g 3.4 g / 2 candies 3.4 g / 6 capsules

Source: Cantrill and Kawamura, 2008.

Initially, esterified plant stanols and sterols were commercially used in fat-based foods such as margarines, shortenings and mayonnaise, but recent clinical studies have shown that the cholesterol-lowering efficacy of esterified plant sterols and stanols is independent of the food matrix (Mensink *et al.*, 2002; Clifton *et al.*, 2004; Hyun *et al.*, 2005). The commercial esterification of plant sterols and stanols with fatty acids from vegetable oil has made it possible to produce dairy products containing the desired esters and also well accepted sensory characters in all the designer dairy products.

The use of a low fat vehicle for delivery of stanol esters was tested by Mensink *et al.* (2002), who showed reductions in total and LDL cholesterol levels in individuals consuming stanol ester in low fat yogurt were comparable to those observed with similar amounts of stanol ester taken in the form of margarine. Salo and Wester (2005) also showed that cholesterol-lowering efficacy of plant stanol esters was independent of the food type (meat-based ready-made low fat meals, pasta, and low-fat yogurt drinks) in which it is incorporated. Gylling and Miettinen (1999) showed that plant stanol esterified with butter fatty acids (predominantly myristic acid) and dissolved in butter was just as effective in lowering LDL cholesterol as was plant stanol esterified with rapeseed oil and dissolve in margarine. Low-fat yogurt enriched with plant stanol ester was effective in reducing cholesterol level in a habitual diet without restriction of fat and cholesterol intake (Hyun *et al.*, 2005). With esterification of plant stanols, the food vehicle need not have a high fat content to be an effective means of delivery of plant stanol (Salo and Wester, 2005). Both phytosterol and phytostanol esters give an enhanced creamy texture to low fat dairy products (yoghurt/ drinking yoghurt). They may also improve the taste of food products by masking bitterness and hence reduce the amount of sugar or other sweetener required to obtain a pleasant taste and mouth feel (e.g. in milk drinks, buttermilk, soy drinks etc).

Clifton *et al* (2004) demonstrated that phytosterols in all food forms tested, lowered serum LDL cholesterol with low-fat milk being the most effective vehicle with a 16% lowering with 1.6 g/day of phytosterols. Mannarinoa *et al* (2009) demonstrated that, 6-week phytosterols consumption with low-fat fermented milk accounts for a significant 12% reduction of plasma LDL cholesterol levels, an effect that may be reached after just only 3 weeks of active

consumption without adverse effects. Findings by Noakes *et al* (2005) showed that low-fat dairy based food products, like milk and yoghurt enriched with plant sterol esters, are similarly effective in lowering TC and LDL-cholesterol concentrations as fat-based foods like spreads and margarine. Seppo *et al* (2007) reported that low-fat milk products (yogurt, yoghurt single-shot drink or milk) enriched with plant stanol esters lowered both total cholesterol and LDL cholesterol. A study by Thomsen *et al* (2004) showed for the first time a substantial reduction in LDL cholesterol with a new, partly vegetable oil filled 1.2% low-fat milk product, containing non esterified plant sterols from soybean oil, in a randomized, placebo-controlled trial. Plana *et al* (2008) evaluated the efficacy and side effects of plant sterol enriched fermented milk in reducing LDL-cholesterol and increasing the number of patients who attain their therapeutic targets. They concluded that plant sterol- enriched fermented milk significantly reduced LDL-C (10.6%) and increased the number of moderately hypercholesterolemic patients achieving therapeutic targets.

Reports from a plethora of studies encourage further development of novel low-fat dairy products containing free plant sterols for future use in cholesterol-lowering initiatives. Thus, the range of foods that can be enriched with plant sterol esters can be expanded to include low-fat dairy foods such as plant sterol-enriched milk, yoghurt, buttermilk, lassi, flavored milks, paneer etc. These foods are perceived as nutritious and healthy and can be easily integrated into a heart healthy diet, helping to maintain desirable cholesterol levels or providing an additional dietary option to help lower elevated cholesterol levels. These convincing results encourage further development of novel cholesterol-lowering, low-fat dairy products with plant sterols, expanding the food product alternatives for consumers, the functional food industry and the global health service.

6. Reactions in foods

6.1 Stability at high temperatures

Phytosterols and their fatty acid esters are quite stable compounds and undergo only limited degradation during oil processing. Only under harsh conditions, such as high temperatures (>100°C) in the presence of oxygen, oxidation of the phytosterol moiety may occur, in the same way as for cholesterol (Soupas *et al*, 2005; Soupas, 2006). Phytosterols are

mono-unsaturated compounds (double bond in the B-ring), which are much more stable than the mono-unsaturated fatty acids (e.g. oleic acid), because of steric hindrance by the ring structure. Therefore, even under severe conditions, such as during shallow frying, sterol oxidation products form only slowly (Thanh *et al*, 2006). Under conditions of use for shallow frying by consumers, (temperatures 160-200 °C, 5-10 minutes of frying) the level of oxidation of sitosterol esters remains below 1.3% when the matrix consists of liquid oil or liquid margarine and if using free sterols these levels are somewhat higher at 2.5% and 5.1%, respectively (Salta *et al*, 2008; Soupas *et al*, 2007). Factors affecting phytosterol oxidation include not only temperature and heating time, but also the composition of the lipid matrix. Since Indian dairy products such as dahi, misti, paneer, butter milk, lassi etc can be processed under 100⁰ C, it is best to opt for dairy products as vehicles for phytosterols fortification as compared to other vehicles which involves high temperature processing.

6.2 Stability during product manufacturing and storage

Phytosterols and phytostanols are microbiologically largely inert as shown by the absence of an effect during the fermentation process used to produce yoghurt (Monu *et al*, 2008). Furthermore, the ester added to various food products show excellent stability at different pH values during long term storage (up to at least a year). Phytostanol and phytosterol esters are also stable in milk and fermented milk and products with viable bacteria like yoghurts and yoghurt drinks (Cantrill and Kawamura, 2008).

7. Regulatory status

Phytosterols, phytostanols and their esters have been evaluated globally by various authorities. Following thorough assessment, positive approval for phytosterols has been obtained in the European Union (EU), Australia, Switzerland, Norway, Iceland, Brazil, South Africa, Japan, Turkey and Israel. Furthermore in the USA a 'self-GRAS' (GRAS = Generally Recognized as Safe) procedure has been followed for both phytosterols and phytostanols, to which the US FDA raised no objections. The first GRAS approval was obtained in 1999 for phytosterol esters for use as an ingredient in vegetable oil – based spreads. In addition to receiving approval by the FDA, phytosterol esters have also been evaluated by major health

organizations in the United States. In the European Union (comprising 27 countries), the use of phytosterols, phytostanols and their esters in foods is regulated under Regulation (EC) No. 258/97 of the European Parliament and of the Council of 27 January 1997 concerning novel foods and novel food ingredients (Cantrill and Kawamura, 2008). India is yet to develop phytosterols enriched products and bring them on to market shelves with all regulatory approvals.

8. Conclusion

Phytosterols are naturally found in all plant origin food products. Naturally available phytosterols have effects on cholesterol metabolism. People consume phytosterols through diet every day but in a small quantity which may not be effective for lowering LDL cholesterol levels, but if foods are enriched with plant sterols or their esters at a level of 2-3 g / day, they may help reduce the LDL cholesterol levels significantly. Over the past decade, the possibility of using phytosterols as a functional food ingredient has led to numerous research studies in relation to their ability to reduce blood cholesterol. Initially, phytosterol esters were commercially used in margarines, but recent clinical trials show that phytosterol esters effectively reduce blood cholesterol, even if used in food vehicles with low fat foods. As Indians consume considerable amounts of products such as milk, curd, lassi, butter milk, flavored milk, fruit bars, fruit juices etc, introducing phytosterols, as functional ingredients, into most commonly consumed food products will increase consumption and help maintain healthy cholesterol levels in the Indian population.

At the current growth rate of coronary vascular diseases throughout India, it can be expected that the Indian market demand for phytosterols enriched products will start in the near future. There is no doubt that phytosterols as functional food ingredient will be a new approach to reduce LDL cholesterol through various foods will hold great promise for long-term health management. The use of phytosterols in commonly consumed Indian foods may soon provide an effective tool against many diseases and its introduction to Indian subcontinent is worth anticipating in the near future.

