



# Central Institute of Post Harvest Engineering & Technology Ludhiana

**OUR SLOGAN: PRODUCE, PROCESS AND PROSPER**

**CIPHET E – Newsletter for August, 2009  
Vol. 4 No. 8**

## Director's Column



Dear All,

Major event for the institute this month was launch of a workshop of NAIP sub project on 'Novel biotechnological process for production of high value products from rice straw and bagasse' in which CIPHET is one of the partners. It was organized at GNDU, Amritsar on 5th August, 2009. The aim of the project is to develop efficient process for handling, pretreatment for selective delignification, and to develop optimal enzymatic hydrolysis process for pre-treated rice straw and bagasse for production of fermentable sugars followed by their concentration.

Another important event organized in SKUAST-K was bi-annual workshop of AICRP on (APA). The Chief Guest, Prof. Anwar Alam, Vice-Chancellor of Sher-E-Kashmir University of Agriculture, Sciences and Technology, Kashmir (SKUAST-K), stressed on promoting surface covered cultivation, rainwater harvesting, water conservation through plastic lined pond etc., which is the need of the hour. With the usage of plastic lined ponds, 33 percent water saving is achieved and by usage of drip irrigation 35-50 percent water saving and almost same percentage increase is also achieved in the agricultural production. He elaborated on other usage of plastics like poly house, mulching, nursery raising and vegetative propagation in poly house, which can tremendously increase the remuneration of the farmers.

It was heartening to see that people from far away places are visiting CIPHET to learn the new techniques of value addition and new avenues for enterprise development in the area of food processing. A batch of twenty participants (consisting of 18 women and 2 men) attended one week training on Post Harvest Technology for Rural Catchments at CIPHET, Ludhiana during 20-26 August 2009. The group has already tried green chilli powder and reported their happiness. The problem of packaging of processed products was also discussed in detail and appropriate packaging materials were provided to them. Ten days Special Training Programme on Post Harvest Management of Fruits and Vegetables was also organized for officials from Uttarakhand so that the message of food processing can be spread at accelerated speed.

The Institute organized its seventeenth Research Council Meeting on 23 – 25 August 2009 at CIPHET Ludhiana. Some of the key achievements from concluded projects were popping unit for makhana, instant makhana kheer mix, beetroot and carrot powder for ready to serve drink, pomegranate arils extractor, low cost belt dryer, package of practice for minimal processing of vegetable, blast chiller and package of practice for green chilli puree and paste.

Institute also celebrated the 63<sup>rd</sup> Independence Day with enthusiasm and prayed for good health of the citizens in the event of out break of swine flue and for good rains as till that time the monsoon was deficient.

With best regards

**R.T. Patil  
Director**

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**National seminar on 'Enhancing Agricultural Productivity and Profitability' at CMFRI, Cochin**

A national seminar on 'Enhancing Agricultural Productivity and Profitability' was organized at CMFRI, Cochin on August 29-30, 2009. The inaugural session was chaired by Hon'ble Secretary DARE and Director General (ICAR), Dr. Mangala Rai, New Delhi and the Chief Guest of the function was Professor K.V. Thomas Hon'ble Union Minister of State for Agriculture, Government of India. The honorable DG stressed that between year 1980 and 2000 share of agriculture in national income declined from 38.8 to less than 18 percent, however, the workforce engaged in agriculture almost remained at same level. This has created a serious disparity between agriculture and non-agriculture and urban and rural India. During the same period income in non-agriculture sector has more than doubled whereas in agriculture this increase is less than 12 percent in real terms. The performance of the Indian agriculture shows that crop husbandry has been the principal source of income-generating activity in agriculture, followed by livestock. The share of the crop sub-sector in agricultural GDP is declining, while that of the livestock and fisheries has shown a rising trend. Within crop sub-sector, non-food-grain crops are growing faster than the food-grain crops.



Inaugural Ceremony of National Seminar on 'Enhancing agricultural productivity and profitability' at CMFRI, Kochi on August 29, 2009

About the importance of farm machinery Hon'ble DG stressed upon use of improved agricultural tools and equipment which have contributed to food and agricultural production in India by 20-30 percent and saving in seeds, fertilizers, time, and labour; and also by increased cropping intensity and productivity. Mechanical power for tillage irrigation, harvesting and threshing is preferred through custom hiring by those farmers who cannot afford to own machines. Laser leveler is another new technology, which is becoming increasingly available on custom-hiring basis, which has also come up as the means of entrepreneurship for rural-youth. Mechanization of rice, sugarcane, cotton, potato and horticultural crops, greenhouses, covered cultivation, animal husbandry and fish production are new emerging areas, which need greater attention. There is a need to develop and promote use of energy efficient farm implements, tools and machinery.

Director General also stressed upon importance of post-harvest management and value-addition for realizing optimal returns and employment from agricultural produce and by-products. Despite low level of processing, food-processing industry is one of the largest industries in India - it ranks fifth in terms of production, consumption, export and expected growth. The extent of processing in fruits and vegetables is very low. The demand for processed food is increasing rapidly due to rising urbanization and income levels. Due to this, processed food market is likely to go up many folds in the near future. Food processing has, therefore, been declared as one of the priority sectors.

He felt that reducing regional disparities is another important issue that needs serious attention. There is a need to target rainfed, hilly, coastal and tribal and other ecologically sensitive areas for dissemination of improved technologies and development of infrastructure. Development of roads, transport, storage, processing and value addition of farm produce, markets, financial institutions etc. on priority to bring much needed equity, social justice and balanced harmonized growth is considered crucial. Several parts of India are already facing severe water shortages as a result of the growing population and food demands. By 2020 we would need about 29% more water for agriculture whereas water availability is likely to be reduced by 12%. Therefore, not only sustainable development of potential sources of water, but also to augment, conserve and manage these resources through improvement in water storage, conveyance, application and crop-water-use efficiencies, without detriment to environment and natural resource base is imperative, hence enhanced effort and support is needed.

To address the various challenges, Honorable DG suggested a multi-pronged strategic intervention that should focus primarily to:

1. Enhance investment in agriculture for creation of need-based infrastructure;
2. Develop human resources and effective knowledge management system;
3. Enhance productivity and competitiveness of farm produce, create, processing, product development, value addition opportunities in the actual area of production;
4. Promote farmer-consumer linkages by improving marketing efficiencies to harness emerging opportunities; and
5. Provide an enabling policy environment so that farmers could access input and output markets, reduce cost, and receive remunerative prices to ensure agriculture as a profitable and honorable venture.

Dr R T Patil, Director, CIPHET, participated in this seminar and presented the paper on “Diversified Value Added Products for Enhanced Input Use Efficiency in Agriculture” in the technical session-IV on 30<sup>th</sup> August, 2009.

### **Launch workshop of the NAIP project on Novel biotechnological process for production of high value products from rice straw and bagasse**

The launch workshop of NAIP sub project on “Novel biotechnological process for production of high value products from rice straw and bagasse” for which CIPHET is one of the partners was organized at GNDU, Amritsar on 5<sup>th</sup> August, 2009. Dr. A. Bandopadhyay, NC- NAIP outlined about the different components of NAIP and their management and relevance to Indian agriculture research system. Dr R T Patil Director CIPHET emphasized the need for better post harvest management of the agricultural residues as the non-edible portion in most of the cases exceeds the edible part and also talked about the need for developing bioconversion technologies which can have broad implications for the country. Since CIPHET has 9 NAIP projects and playing the role of consortium leader in 2 such projects, the systems are well in place and all the rules laid down by NAIP are being followed. Mr. Devendra Kumar, Director (Finance), NAIP clarified that NAIP projects are governed by World Bank rules and no deviation from the same is possible. He specifically touched upon the issue of budget utilization and importance of submission of SOEs in time and wished project good luck. Dr. UC Banerjee, CAC member stressed upon the importance of bioconversion technologies for agricultural residues. He also touched upon the fact that a few such projects are running in CSIR Institutes and IITs, but all such projects are single Institutional and hence have not resulted in any significant outcome. He lauded the efforts of NAIP of coming out with such multi Institutional activity, where the expertise of the researchers working in different areas can be clubbed together, which is likely to result in a productive outcome. Dr. Raghubir Singh, Dean (Academic Affairs), GNDU welcomed the guests on his behalf and on behalf of the VC, GNDU and assured the members that GNDU would strictly follow all the guidelines issued by NAIP from time to time and extend full support for successful implementation of the project activities. Dr. BS Chadha then made a brief presentation about the project activities and explained the features of the project.

### **AICRP on APA Workshop**

The workshop was organized in SKUAST-K under the aegis of Division of Agricultural Engineering, Shalimar, Srinagar from August 18 to August 20, 2009. The AICRP on APA is operating at its 11 centers, (SKUAST-K being one of them) and Coordinating Unit is located at Central Institute of Post Harvest Engineering & Technology (CIPHET), Ludhiana. The Chief Guest, Prof. Anwar Alam, Vice-Chancellor of Sher-E-Kashmir University of

Agriculture Sciences and Technology, Kashmir (SKUAST-K), stressed for promoting surface covered cultivation, rainwater harvesting, water conservation through plastic lined pond etc. He told that by the usage of plastic lined ponds, 33 percent water saving is achieved and by usage of drip irrigation 35-50 percent water saving and almost same percentage increase in the agricultural production with good quality is achieved. He elaborated on other usage of plastics for poly house, mulching, nursery raising and vegetative propagation in poly house, which can tremendously increase the remuneration of the farmers. Prof. Anwar Alam also advocated Modified Atmospheric Packaging (MAP), which can be done by manipulating suitable concentration of oxygen and carbon dioxide level in the plastic package thereby increasing the shelf life and storage periods. Dr. P.R. Bhatnagar, Projector Coordinator, AICRP on APA, presented the Project Coordinator's Report. He discussed about the major applications of plastics like greenhouse, low tunnel, shade nets, water harvesting, plastic lined pond, micro irrigation system, greenhouse type solar drier and packaging with plastics. The DDG (Engg.), Dr. M. M. Pandey mentioned that challenges facing Indian agriculture are ever-growing input cost and lower or stagnant output cost. Hence farmers are not motivated to remain in farming. Hence, high quality high value, off season vegetable grown in poly house can offer much needed extra revenue even to the small farmers. Dr R T Patil stressed upon the problems and challenges faced by Indian agriculture such as, scarcity of water due climate change and fragmentation of land holdings due to increasing population. The use of plastic in polyhouse, micro irrigation has come to the rescue of the Indian farmers just like zero till drill in the farm mechanization. The equation of half input and twice out-put is a wonder equation which needs to be converted into reality in the farmers field and hence the post-harvest engineers and the team associated with them need to work hard to popularize this technology. There is a need to sensitize the hardware store and agro service centers in rural areas for the construction and maintenance of poly houses. There are many schemes of the Govt. for demonstrating the poly house technology but they are not supported with network of dealers and maintenance people accessible in the rural areas and hence, the transfer of technology remains un-effective. The minimal processing and proper management and value addition to commodities grown with green house technology are also important. The higher productivity may result in the glut in the market and reduce the profitability of farmers, hence simultaneous technology support of post harvest management and value addition technology is very essential. The higher production of commodities through intervention of APA should utilize the technology developed at CIPHET and AICRP on PHT for their proper handling, preservation and value addition.



Annual work shop of AICRP on APA

## One week training on Post-Harvest Technology for Rural Catchments

A batch of twenty participants (consisting of 18 women and 2 men) attended one week training on Post Harvest Technology for Rural Catchments at CIPHET, Ludhiana during 20-26 August 2009. The training was sponsored by ATMA Purnea, Bihar. It was coordinated by Dr. D. Dhingra and Dr Sangeeta Chopra. The participants were led by Mr Saket Ranjan and Mrs Jasvir Kaur. They are running a SHG of women. The women are engaged in preparation of *pappad* from rice. The product is sold by the SHG under brand name Sky Snacks. The group visited CIPHET Ludhiana to improve their skills, solve their problems and learn techniques of preparing novel value added products. The participants were exposed to the concepts of processing of soybean, packaging, minimal processing of fruits and vegetables, value addition of fruits and vegetables, dehydration of fruits and vegetables etc. The practicals were conducted and they were given hands on training on preparation of soymilk, jam, green chilli powder, preparation of project profiles etc. The group has already tried green chilli powder and reported their happiness. The problem of packaging of processed products was also discussed in detail and appropriate packaging materials were provided.



Dr R T Patil, Director CIPHET interacting with the participants from Purnea Bihar

## CAC meeting of NAIP subproject on “Development of non-destructive systems for microbial and physico-chemical quality parameters of mango”

The 4<sup>th</sup> CAC meeting of NAIP sub-project on “Development of non-destructive systems for microbial and physico-chemical quality parameters of mango” under component-4 was held at CIPHET, Ludhiana on 03.08.09 at 2.00 pm. The members participated in the meeting were **Dr. Suresh Parsad, Professor Emeritus**, IIT, Kharagpur and chair of the meeting, , Dr. E. S. Rajagopal, Prof. Emeritus, IISc, Bangalore, Expert member CAC, Dr. A. Bandopathyay, National Coordinator for NAIP component-4, Dr. R. T. Patil, Director, CIPHET, Ludhiana, member CAC. The special invitees were Dr. S.F. D’Souza, BARC Mumbai, Prof. C. K. Mitra, University of Hyderabad, Dr. Sunil Bhand, BITS Pilani, Goa Campus, Prof. Sudhir Chandra, IIT, Delhi, Prof. Ratnamala Chatterjee, IIT, Delhi and Prof. Neelum Verma Punjabi University, Patiala. The progress of the project after last CAC was discussed in detail, such as acquisition of NIR spectral data, isolation of bacteria, fungus and yeast and determination of physicochemical quality parameters of 9 varieties of mangoes collected thrice from nine

states. Dr. Nachiket Kotwaliwale presented images taken by x-ray, CT and MRI machines varying different currents and voltages. He pointed out that detection of internal defects or microbes are possible by scanning these mangoes. CAC members were happy to see the scans. The CAC appreciated the salient achievements and requested to present the progress of each centre individually.



CAC meeting in progress

### **Special Training Programme on Post Harvest Management of Fruits and Vegetables for officials of the Directorate of Horticulture and Food Processing, Ranikhet, Uttarakhand**

Ten days Special Training Programme on Post Harvest Management of Fruits and Vegetables for officials of the Directorate of Horticulture and Food Processing, Ranikhet, Uttarakhand was organized during August 03-12, 2009 at CIPHET, Abohar. 18 Horticulture Officials from various Districts of Uttarakhand (Government of Uttarakhand) participated in the training programme. The training included lectures and practicals on Post harvest management of fruits and vegetables and their by products, Microbial spoilage of fruits and vegetables causing food poisoning, Drying and Dehydration of fruits and vegetables for value added products, Post harvest losses and its control in fruits and vegetables, Processing and value added product form aonla, Minimal processing and packaging of leafy vegetables, EC concept and its benefit for enhancing shelf life of fruits and vegetables, Processing of onion, ginger, garlic and concept of Agro-Processing Centre, Post harvest diseases and disorders of fruits and its control, Some novel product development from guava and other fruits, Minimal processing including arils extraction of pomegranate and extending their storage life, Commercial cultivation and post harvest management of cut flowers, Essential oil and other ingredient extraction technology for aromatic plant and fruits waste, Scope of shrink packaging of fruits and vegetables, Processing and value addition of Vegetables, Loss reduction in vegetables adopting appropriate Post Harvest Management practices, etc. The training also included the practical classes on novel products preparation from guava and pomegranate. The participants were also exposed to different laboratories at CIPHET, Abohar as well as at Ludhiana. Further, participants also visited Punjab Agro Juices Limited, Abohar, PAU Fruits Research Station, Abohar, Hi-tech Nursery, Mauzgarh and scientifically managed farmer's orchards. The training was conducted by Dr. R. K. Gupta, HOD, HCP as Course Coordinator and Sh. V.K. Saharan, Technical officer as Co-Coordinator.



Participants from Utrakhand for Special Training Programme on Post Harvest Management of Fruits and Vegetables at CIPHET, Ludhiana



Participants from Utrakhand for Special Training Programme on Post Harvest Management of Fruits and Vegetables at CIPHET, Abohar

### **Season Long Training programme on IPM in Cotton organized by Central Integrated Pest Management Center, Jalandhar in association with CIPHET**

Season Long Training programme on Integrated Pest Management of Cotton was organized by Central Integrated Pest Management Center, Jalandhar, Ministry of Agriculture, GOI, in association with CIPHET, Abohar for 30 days from August. 3 to September 1, 2009. 23 participants mostly Govt. officials of cotton growing regions of Punjab participated in the training. Among the participants, there were 13 Agriculture Development officers from Ferozepur, Bhatinda, Moga, Fardikot, Mansa, Mukatsar, Sangrur, Tarn Taran, Ludiana and Patiyala districts of Punjab. One trainee was from Ratan Tata Trust, Abohar. Three trainees were young farmers and field scouts. 05 trainees were from CIPMCs, Jalandhar, Solan, Jammu and Indore. The training was fully field oriented, participatory, learning by doing and non-formal education. Four farmers field schools were also organized by the trainees (one village by each group) to transfer the IPM knowledge to farmers in Kundal, Govindgarh,

Dharangwala and Muradwala villages of Abohar sub district. Short duration experiments on different topics were organized by the trainees and facilitators. Main emphasis was given on the identification of cotton pests and natural enemies in the field. In the end a report on the programme was submitted by the individual trainees. In the valedictory function Sh. Amit Dhaka, SDM, Abohar was the Chief Guest. Dr. Jasbir Singh, Asst. Director, IPM Centre, Jalandhar was the Training Coordinator. Sh. V.K. Saharan, Technical Officer and Dr. R.K. Gupta, Head. HCP were actively involved from CIPHET for conducting the programme.



Valedictory function Season Long Training programme on IPM of Cotton

### **Regents of UAS Bangalore visited CIPHET**

The Members of Board of Management, University of Agricultural Sciences visited CIPHET on August 2, 2009 to see the recent advances in post harvest management and value addition of Agricultural and Horticultural commodities. The regents were accompanied by Dr. A. Nagaraja, Professor of Plant Pathology, Small Millets Unit, University of Agricultural Sciences, Bangalore. The members were Smt. Asha Seshadri, Mr. S.D. Sampath Samrajya, Mr. Atthihally Devaraj, Mr. K.C. Shankaregowda. Dr R T Patil, Director CIPHET welcomed the regents and explained the CIPHET technologies. Later on they were also shown the CIPHET facilities, which included various types of extruders at CIPHET, pilot plants, sprayer dryer, soy/ground nut milk machine, evaporative cooled rooms and oil milling laboratories. The CIPHET has also collaborative facility at UAS, Bangalore to develop pilot plants for technology incubation and entrepreneurship developed and regents appreciated the efforts CIPHET in developing the new technologies and also promoting the production catchment processing through entrepreneurship development programmes. Honorable members were presented with a hand tool for banana hand cutting as memento from CIPHET, Ludhiana



Regents of UAS Bangalore visiting CIPHET facilities



Visitors with CIPHET developed hand tool for banana comb cutting

### **Institute Research Council**

The Institute organized its seventeenth Research Council Meeting on 23 – 25 August 2009 at CIPHET Ludhiana. The completed projects, ongoing projects and new projects were discussed. Dr. Pitam Chandra, ADG (PE) graced the occasion as a Chief Guest & Expert. Dr. Pitam Chandra ADG (PE) emphasized that the output of the project should be converted into outcome and the technologies developed should be transferred to end users. The Institute should develop the linkages with crop Institute of ICAR to identify the research gaps in the area of post harvest technology. Dr. R.T. Patil stressed that scientists of CIPHET should provide lead role in the area of post harvest through their projects. The project should be demand driven and need based. Some of the key achievements from concluded project were popping unit for makhana, instant kheer mix, beetroot and carrot powder for ready to serve drink, pomegranate arils extractor, low cost belt dryer. The significant output of the ongoing project were value addition in fruits and vegetable, shelf life enhancement of Guava, process protocol for meat tenderization, package of practice for minimal processing of vegetable, blast chiller, package of practice for green chilli puree and paste and fruit based extruded products.

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कर्मचारी मनोरंजन क्लब के तत्वाधान में संस्थान में 63वें स्वतंत्रता दिवस समारोह मनाया गया। निदेशक, सीफेट, लुधियाना ने ध्वजारोहण किया। राष्ट्रगान के उपरान्त अपने उद्बोधन में निदेशक ने संस्थान की गत वर्ष की उपलब्धियों का विवरण दिया। उन्होंने सीफेट के भविष्य के कार्यक्रमों के बारे में अवगत कराया एवं संस्थान की उन्नति की कामना की। इसके उपरान्त बच्चों की खेलकूद प्रतियोगिताएं आयोजित की गयीं।

इसके उपरान्त क्लब ने सांस्कृतिक कार्यक्रम का आयोजन किया। इसमें क्लब के सदस्यों, उनके परिवारजनों एवं बच्चों ने मनमोहक सांस्कृतिक कार्यक्रम प्रस्तुत किये। इस कार्यक्रम को निदेशक सीफेट, क्लब के अध्यक्ष एवं अन्य सदस्यों ने बहुत सराहा।

इस दिन स्टाफ वेलफेयर फंड की तरफ से सीफेट स्टाफ की एक मेधावी छात्रा को जिसने दसवीं कक्षा के पंजाब बोर्ड की परीक्षा में 2007 में 70% से अधिक अंक प्राप्त किये थे को डा० आर. टी. पाटिल, निदेशक, सीफेट ने पुरस्कृत किया जो कि पिछली बार किसी कारण अपना पुरस्कार प्राप्त नहीं ले पाई थी। इस कार्यक्रम के लिए मुख्य अतिथि श्री. ह. ए. पाटिल, सेवानिवृत्त प्रधान अध्यापक, एरन्डोल, जलगाँव थे। कार्यक्रम के अन्त में खेलकूद प्रतियोगिताओं के विजेताओं एवं उपविजेताओं को डा० आर. टी. पाटिल, निदेशक, सीफेट, लुधियाना एवं मिसेज पाटिल ने पुरस्कार वितरण किया।



Independence day celebration at CIPHET, Ludhiana

### Upcoming Events:

1. ICAR sponsored Winter School on **“Quality assurance and shelf-life enhancement of fruits and vegetables through novel packaging technologies”** will be held at CIPHET, Ludhiana during September 25 to October 15, 2009. The Course Director is Dr. D.R. Rai, Principal Scientist, Agricultural Structures & Environmental Control Division. You can contact him on Tel: +91 - 161-2313123, 0161-2819934 (R), 09417366034 (Cell), Fax: 0161-2308670, Email: [d\\_r\\_rai@yahoo.com](mailto:d_r_rai@yahoo.com), [dr Rai66@gmail.com](mailto:dr Rai66@gmail.com).
2. ICAR sponsored Winter School on **“Recent developments in post harvest processing and value addition to livestock produce”** will be held at CIPHET, Ludhiana during October 22 to November 11, 2009. The Course Director is Dr. K. Narsaiah, Senior Scientist (ASPE). You can contact him on Tel: +91 - 161-2313124, 09417143925 (Cell), Email: [knarsan@yahoo.com](mailto:knarsan@yahoo.com) Fax: 0161-2308670.

3. ICAR sponsored Hindi Seminar on “xkfe.k mlu; u ea df”k i d d d j .k m | ks dh Hkfedk fo”k; ij fglnh ea jk”Vh; l æks”Bh dk vk; kst u uoEcj 13&14] 2009 dks l hQV] yf/k; kuk ea fd; k tk, xkA l æks”Bh ds fy, i athdj .k , oa vU; dkbz Hkh l p uk i klr djus ds fy; s vki fuEu i rka ij सम्पर्क dj l drs gâ

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## Joining:

### Er. V.Eyarkai Nambi



Er. Nambi has joined CIPHET on 29-08-09. He is having B.Tech Food Process Engineering and M. Tech in Agricultural Processing from TNAU, Coimbtore. In his PG research he worked on the development of Continuous Seed Removing Machine for Aonla Fruit, which has been filed for patent (IPR). He was teaching in a private university in the field of food processing prior to his joining ARS in ICAR.

## Transfer/Promotion:

Sh. Vijay Kumar AF & AO promoted to the post of FAO, NAIP, New Delhi and released in the afternoon of 4.08.2009

## Technology of the Month

### Low cost collet extrusion for expanded/puffed snacks

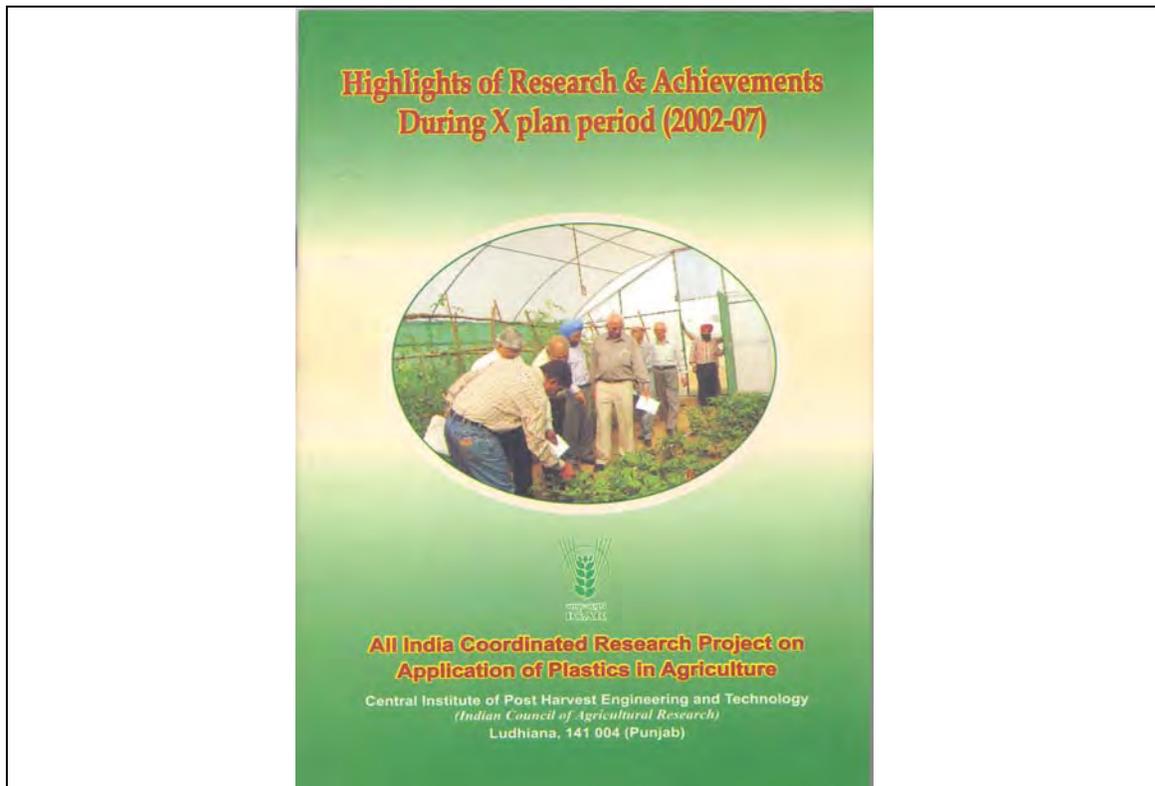
Snack foods now comprise an important part of the daily nutrient and calorie intake of many consumers. Expanded products like snacks and breakfast cereals are very popular today because of their crunchy texture, which arises from the honeycomb structure imparted to the material during extrusion. At CIPHET, an extrusion facility with range of extruders has been established during last 3 years. In particular a collet extruder of small capacity (25-35 kg/h) shows a very promising feature for the production of low cost protein enriched ready-to-eat expanded snacks. This heavy-duty low cost collet extruder, driven by 10 hp AC motor and feed rate is controlled with a 1 hp DC motor. The length to diameter (L/D) ratio of extruder was 5:1. The barrel is enrobed with cold/ tap water circulation to maintain the temperature. For the development of ready-to-eat snack foods, screw speed (500 rev/min), feed rate (25



kg/h) and feed moisture (14%, wb), feed particle size (1.65-2.36 mm) were found optimum and kept constant for different protein enriched extruded snack foods. It is attached with a cutter (1 hp DC motor). The feed of required particle size with predetermined formulation can be fed through feeder, which can be regulated by screw auger. The expanded products of 14-20 mm axial diameter can be produced.

The investigation was carried out at CIPHET with this low cost collet extruder for the continuous production of protein enriched expanded snacks at optimum extrusion condition and different legumes incorporations (black gram, green gram, lentil and peas) on selected cereals and coarse cereal grit. It was found that this is suitable to process and produce legume blended cereals and coarse cereals expanded snack foods and instant flour with low moisture (<14%, wb) and low lipid content. Extrudate flour which are partially dextrinised and gelatinized during the treatment, yielding instant flour showed the scope for preparation of higher energy density gruels. The lower viscosity profile of extrudate flour as compared to its raw composite flour and higher nutritional and sensory values expressed the usefulness and possibility of product development, especially high quality diet and weaning foods at competitive prices, which can dramatically transform the Indian cereal industry. This food extrusion facility costs about Rs. 2.0 Lakhs. This can be easily adopted by the small and cottage level entrepreneur for the production of Ready-To-Eat snacks and similar products. This production is highly profitable (about Rs. 14/kg of product). This technology facilitates use of low cost rice and wheat brokens to be converted into high value ready to eat snack foods at rural catchments. At CIPHET we offer one week training programme for upcoming entrepreneurs on this technology for establishing rural enterprises.

## Publication of the Month



Highlights of Research and achievements during X plan period (2002-2007) were released during the Annual Workshop of AICRP on APA at SKUAS&T-K, Srinagar on 18-20 August 2009

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