



Central Institute of Post Harvest Engineering and Technology, Ludhiana

Our Slogan: Produce, Process and Prosper

CIPHET E – Newsletter for May, 2008
Vol. 3 No. 5

Director's Column



Dear All,

The balanced diet and consumption of foods having phyto-chemicals is a natural way of keeping human health fit. It is always wise to “let food be your medicine than medicine be your food” . In modern day living even a minor ailment is immediately attended to by a heavy dose of allopathic medicine having tall claims and plenty of side effects. The cure from one ailment leads to the beginning of new one and hence the symposium **Food for Health** organized by NIFTEM (Ministry of Food Processing Industries) and Cornell-Sathguru Foundation was very appropriate. The health foods are functional foods, nutraceuticals and also the organic foods. The more the brain storming takes place about the opportunities and challenges in production and processing of these crops it would be better for the future of Indian agriculture.

In India there are many agencies working on developing appropriate technologies for post harvest management, value addition and also other rural development technologies including low cost tools and gadgets. However developmental departments seem to be not aware about these developments and many times efforts are made for reinventing the thing which is already made. Hence it is essential that there is an interaction among all concerned institutions. The National Consultation on Rural Technology organized by CAPART, Min. of Rural Development at CGO complex, New Delhi was a good initiative in this direction. I feel that if the funding is made available to the innovating scientists for multiplication of their innovations along with the contractual manpower to undertake such activities along with feed back and bench mark studies, it will go a long way in effective transfer of these technologies which are just lying on the shelf. The NHB has already a scheme like this in place called “Technology Development and Transfer for Promotion of Horticulture” under which CIPHET is likely to get funding for Multiplication, field demonstration and distribution of “CIPHET Banana-comb / hand cutter”.

India is a leading BER producing country. The shelf-life of *ber* is a very short hardly 2-4 days in ambient condition, which leads to market glut. Considering this CIPHET has developed preservation and processing technology for this fruit and one week training programme for upcoming entrepreneurs was held at CIPHET. Similarly an entrepreneurship development program on "Ginger, Garlic and Onion powder making technology" was also organised for nineteen women participants from SHGs in Nagpur Maharashtra, along with some participants from Sikkim and Punjab.

During this month two CIPHET technologies have been transferred to the upcoming entrepreneurs. One was ‘Method of preparation of Porous Bricks’ transferred to M/s Rajinder Dev & Co. Village Bhanohar, P.O. Mullanpur, Ludhiana and another was “Construction of Evaporative Cooled Room” to Motion of Integrated Technology for Rural and Agricultural (MITRA) Nayaka Gaon, Dharamsala Road, Sasaram in Bihar.

With best regards

R.T. Patil,
Director

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Indo US Agricultural Knowledge Initiative Projects on extrusion processing and bio-fuel

A meeting was held under the chairmanship of Dr. Nawab Ali, DDG (Engg), ICAR to formulate the Indo-US AKI projects on- 1) Extrusion Processing and 2) Biofuel on 7th May 2008. From CIPHET Dr. RT Patil Director, Dr. RK Goyal and Dr. VK Bhargav attended this meeting. From CIAE Dr. S.D. Kulkarni, Project Director (SPU) and r. Murari Shyam, PC (RES), CIAE, Bhopal participated. Dr. Pitam Chandra, ADG (PE) was also present in the meeting. On the 8th May 2008 the network projects to be coordinated through CIPHET EFC were discussed in which Director, PC(PHT) and concerned scientists from CIPHET participated. One project was on Production of animal feed from crop residues and processing by products and another was Development of scientific post harvest technologies for medicinal and aromatic plants. The cooperating centres as well as their workplan were tentatively discussed and it was decided to incorporate these network projects in the EFC of CIPHET for 11th plan.

Director CIPHET attends Institute Research Council meet of IARI as resource person

In most of the institutes the research project are discussed annually for their review and suggestion for further research as well as new directions to the existing programmes. The Indian Agricultural Research Institute, a premier institution of India discussed the research programmes during May 7-8, 2008. The Director CIPHET Dr. Patil was invited as resource person for post harvest technology division. The projects under taken by the division were meeting to the need present requirement of post harvest management and value addition of

fruits and vegetables. The advantage of post harvest technology division is that it can have access to the reliable products from the newer developed variety to evaluate their processability and give it as an recommendation along with the production practices.

Director CIPHET visits Anand Agricultural University, Gujarat

Dr. RT Patil, Director, CIPHET visited Department of Food Processing Technology & Bio-Energy, AAU along with Dr. HG More, Dean, College of Agricultural Engineering, MPKV, Rahuri and delivered a lecture on Scope of entrepreneurship in the area of Post Harvest Management and Value Addition to Master's and Ph. D. students in the department. They also visited the pilot plant facility of the department for bio-fuel production from Jatropha. This is a state of the art facility of pilot plant which can demonstrate the use of non edible oil seeds for bio fuel production and also the use of by products for value added products for industrial utilization. The department also has a modern dal mill assembled in such a way that selective separation of gota was done at every stage of abrasion so as to reduce the dust and improve the recovery of dal. To achieve this, the mill was provided with a respiration, cyclone and bag house at each stage of dehusking. He also visited the SPRERI, Anand saw the facilities and projects going on and had discussion with Dr. B.S. Pathak and Dr. NSL Srivastava about the scope of power generation using crop residue and biomass from and for Agro Processing Industries in Punjab. He also visited NRC for Medicinal & Aromatic Plants and discussed with Director, Dr. Satyabrata Maiti about in the forthcoming network project on processing of medicinal and aromatic plants being proposed through EFC of CIPHET, Ludhiana.



Pilot plant facilities at Department of Food Processing Technology & Bio-Energy, AAU



Dr. NSL Srivastava, Ex DDG (Engg) ICAR and Dr. RT Patil at Energy Park of SPRERI, Anand, Gujarat

Symposium on Food for Health (Functional Food, Nutraceuticals and Organic Food)

Dr. RT Patil, Director CIPHET attended a symposium on Food for Health (Functional Food, Nutraceuticals and Organic Food) organized by NIFTEM (Ministry of Food Processing Industries) and Cornell-Sathguru Foundation at Hotel Residency, Coimbatore during May 21-23, 2008.

The keynote speakers in the symposium were as follow:

| Key Note | Speaker |
|---|---|
| Novel process technologies | Sh. Syed Rizvi, Cornell University |
| “Nutritionally balanced and economically affordable diets for better human health and happiness” | Dr. Nawab Ali, DDG (Engg.) |
| Developing a regulatory framework in the Indian context | Sh. G. Balachandran, Food Safety & Standard Authority |
| The outlook for organic food and beverages: Market trends and value added products. | Dr. K.V. Raman, Cornell University |
| Health benefits of natural antioxidants: Opportunities and challenges in food industry. | Sh. Rui Hai Liu, Cornell University |
| Research trends and strategies for product development: Functional foods and nutraceuticals | Sh. Rui Hai Liu, Cornell University |
| Regulatory trends and compliances for functional food and organics | Dr. Ramakrishna Rao, USDA |
| Intellectual property rights and benefit sharing for functional foods, nutraceuticals and organics | Sh. K. Vijayaraghavan, Cornell-Sathguru Foundation |
| Discussion session on national policy framework for promotion of functional foods, nutraceuticals and organics led by | Sh. P.I. Suvrathan, Secretary, MOFPI |

The unique feature of this invitational symposium was a group discussion on various topics essential for technology adoption and regulatory compliance-

- Group 1: Sourcing, Developing, Adopting technology for health foods.
- Group 2: Regulatory issues in Functional food and Nutraceuticals.
- Group 3: Organic food – Strategies for value addition, regulation and International market development.
- Group 4: Accelerating Investment in Health foods.

Another feature of the symposium was panel discussion on marketing strategy for functional foods and organics. The panelists were B. Siva Kumar, National Institute of Nutrition and K. Vijayaraghavan, Cornell-Sathguru Foundation. Subramonia sarma, Indian School of Business, Syed Rizvi, Cornell University, Dr. Ramakrishna Rao. The participants also visited organic farm of Amrita Institute nearby Coimbatore. In the plenary session on May 23, 2008,

the recommendations of the group discussion and panel discussion were presented. The Secretary, Ministry of Food Processing Industries, Sh. P.I. Suvrathan commented on the recommendations in the context of national policy of framework for intellectual property rights and benefit sharing for functional foods, nutraceuticals and organics.



Participants of Symposium on Food for Health at Hotel Residency, Coimbatore



Visit to organic farm of Amrita Institute, Coimbatore



Visit to College of Food Process Engineering and College of Environmental Science and Energy at TNAU

Director CIPHET along with Dr. Nawab Ali, DDG (Engg) also visited the College of Food Process Engineering and College of Environmental Science and Energy at TNAU. They also saw the facility of Technology Incubation Center, Experimental Bakery, Labs and Workshop facilities for Food Processing Engineering and also addressed to the Master's and Ph.D. students and faculty about the Role of Food Process Engineering in Food and Nutritional Security of the Country.

National Consultation on Rural Technology

Dr. R.K.Goyal, Principal Scientist participated in National Consultation on Rural Technology organized by CAPART, Min. of Rural Development at CGO complex, New Delhi on 26.05.2008. The conference started with technical session chaired by Shri Rangan Datta, former DG, CAPART. Mr. S.M. Desalphine, DG, CAPART welcomed all the delegates and briefly explained the purpose of this important consultation on rural technology. He

mentioned that various Govt. departments are working on development of rural technology but in isolation and hence the actual benefits are not accruing to rural people. He further added that CAPART has been mandated to act as bridge between technology innovator and rural people through NGOs of respective regions. Chairman Mr. Datta in his opening remark said a good number of technologies are lying on the shelf in R&D institutions just because no two Govt. agencies think alike. He further added that R&D & academic institution neither have time nor expertise to disseminate their technologies effectively. So bodies like CAPART should act as national body for dissemination of technologies to rural area and develop linkages with all such academic and R&D institutions.

Dr. Goyal presented information on Post Harvest Technologies developed by CIPHET, which generated a lot of interest among the participants. He also put forth the request to CAPART to fund a project for transfer of proven technologies to rural areas and also requested the interested delegates mainly from NGOs to visit CIPHET and choose specific topic of EDPs so that they can get confidence to start a business based on training. In the afternoon, group discussions were held under following areas:

- Problem identification, technology development and technology characterization.
- Critical success stories for transfer of technologies, coordination and establishment of linkages including commercialization.
- Role of NGOs in conducting field trials, propagation and establishing micro enterprises.

Institute Research Council Meeting held on May 16 - 17, 2008

The institute organized its Research Council Meeting during 16-17 May 2008 under the Chairmanship of Director CIPHET, Ludhiana. Prof. Rajinder Singh, Ex Head Department of ASPE, PAU Ludhiana was a resource person. The Institute Research Council Meeting discussed completed projects (RPF-III), ongoing projects (RPF-II) and new research project proposals (RPF-I).

Dr. R.K. Goyal Principal Scientist and Member Secretary, IRC welcomed Dr. R.T. Patil, Director, CIPHET, Prof. Rajinder Singh and all scientific and research staff of both the campuses. He informed the house that the IRC meeting is organized twice a year regularly and about fifty projects would be discussed including completed and new proposals. He also presented the Action Taken Report of last IRC.

Dr. R.T. Patil, Chairman IRC and Director, CIPHET talked about the importance of IRC. He told that IRC is an important forum to discuss openly about the projects. He told that our requirement in the development of post harvest technologies is different from developed countries due to fragmented land holdings, so efforts should be made in the right direction to get maximum output. He informed the house that the demand for E-news letter published from CIPHET is increasing. He assured that scientists should be provided scientific freedom to think, to work and urged the scientists to be committed to work. He asked the scientists to encourage hardcore entrepreneurs who could purchase CIPHET technologies and establish their enterprises. He also advocated that scientists should publish their work in referred journals.

Dr Rajinder Singh told that CIPHET has grown to its expectations and is working in right directions. He suggested that institute should work for the farmers and emphasis should be

given to energy efficient devices for post harvest technologies as price of petroleum products have increased manifold. He emphasized that assured quality leads to assured price and desired marketing therefore, very high quality be maintained in post harvest technology.

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| <p>Dr. Goyal, Dr. Patil and Expert Prof. Rajinder Singh, Ex-HOD, PAU as</p> | <p>IRC presentations in progress</p> |

QRT meetings of AICRP on PHT

The final meeting of the Quinquennial Review Team (QRT) of All India Coordinated Research Project on Post Harvest Technology was held during 25-26 May 2008 at CIPHET, Ludhiana. The QRT appraised the status of the Coordination Unit and also finalized the draft of its report of review and recommendations.

In a formal meeting held in the Conference Hall on the forenoon of 26-05-08, the QRT members were welcomed and felicitated by the Director, Project Coordinators, Heads of Divisions and staff of CIPHET, Ludhiana. QRT Chairman Dr. Satish Bal, Professor Emeritus, IIT Kharagpur addressed the scientists of CIPHET. The other members of QRT Dr. RK Jain, Principal, ADIT, Vallabvidyanagar, Dr. US Shivhare, Professor, Panjab University, Chandigarh, Dr. Ashish M Paturkar, Professor, Bombay Veterinary College, Mumbai and Mr. Pawan Agrawal, Director, Khyati Foods Ltd., Bhopal also interacted with the scientists.

The QRT submitted its Report to Dr. Nawab Ali, DDG (Engg) on 27th May 2008 at KAB-II, ICAR, New Delhi.

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| <p>Director, Dr. RT Patil welcoming the QRT members of AICRP (PHT) at CIPHET, Ludhiana</p> |

Quinquennial Review of All India Coordinated Project on Application of Plastics in Agriculture

To review the past five years 2002-2007, the fifth meeting of the Quinquennial Review Team of AICRP on APA was organized during 18-20 May 2008 at SKUAST-K, Srinagar to review the progress of Srinagar centers. The members and invitees presented during the fifth meeting were Dr. Anwar Alam (Chairman), Dr. Brahma Singh (Member), Dr. K.N. Tiwari (Member), Dr. Pitam Chandra (ADG, PE), Dr. Dilip Jain (Secretary) and Dr. P.R. Bhatnagar, (PC, APA).

The QRT visited the experimental field, where the twenty greenhouses were constructed with different designs and observed the strawberry cultivation. QRT also visited the workshop of Agricultural Engineering Dept. They have basic facilities of fabrication and development of agricultural machineries with a basic manufacturing gadgets such as semi-automatic lathe machine, shaper, grinder, sheet bending machine, power hack saw, sheet cutter, arc welding set, gas welding set and pipe-bending machine. The department has developed expertise in construction and installation of greenhouse. The high-tech greenhouses were also under construction.

Dr. RM Shukla, Post harvest engineer (APA), presented the progress of the project. He stated that four experiments are ongoing under AICRP on APA at the centre including strawberry cultivation under greenhouse and open field. The average yield of strawberry by the use of greenhouse, drip irrigation and fertigation resulted in 148% increase as compared to outside field. The production of strawberry was advanced by 45 days by growing in greenhouse as compared to outside field, which fetch better price in market and thereby enhancing the income.

QRT also visited the farmer's field at Dachi Gam Theath harvan in Mahadev Hills, in the evening on 18 May. Mr. Abdul Kadir Afagar of new thead harvan has explained that he had constructed a water tank of 2.5 lac liter capacity. The source of water is perennial stream, which is diverted from around 2 km away from water tank using PVC pipeline. It is used for irrigation in the 5-6 ha of orchard under cherry and strawberry.



AICRP APA QRT meeting at SKUAST-K, Srinagar, Jammu and Kashmir



Hon. Members visiting the research farms in Kashmir

Value Chain on Potato and Potato products a project under NAIP

The CIPHET is one of the partners of the above NAIP projects approved at CPRI as lead centre. The launch workshop of this project was held at CPRI Meerut on 15th May 2008. It was chaired by Dr. H.P. Singh, DDG (Horticulture). Dr. J. P. Mittal National Co-ordinator (NAIP), Dr. S. K. Pandey, Director CPRI Shimla, Dr. B.P. Singh, Joint Director C.P.R.I campus, Meerut and all the Co- PI's and S.A.O and F.A.O. of C.P.R.I Shimla attended the launch workshop. Dr. Dhingra a Cooperating Centre PI from CIPHET attended this meeting. The technical programme at CIPHET is on development of value added products from the process waste especially the potato peels. The guidelines for the project and purchase and recruitment procedures were also discussed in this workshop.

EDP on Processing of *Ber* for Manufacturing of Value Added Products

India is world's leading producing country of *ber*. It occupies around 61300 ha of land with a production of 3797606 MT fruit annually. The shelf-life of *ber* is a very short hardly 2-4 days in ambient condition, which leads to market glut. Considering this and the fast increasing area under *ber* cultivation with high yielding varieties, methods of its preservation and processing technology need to be developed to regulate price of fresh fruit.

During the training complete programme covering pre harvest and post harvest management of *ber* fruit/produce including harvesting, sorting, grading, storage, disorder and disease management etc and processing techniques for making various value added products like *ber* preserves, *ber* osmo-air dried products, squashes, *ber* shreds, *ber* chuahara, jam and jelly, their effective packaging and storage for long shelf life was given. During this training participants were also given exercise for making project profile for starting a small unit for manufacturing the *ber* products.





Various processed products from Ber produced by trainees during the course

National Horticultural Board assures support for CIPHET developed hand tool prototype multiplication

Dr. Dattatreya M. Kadam, Scientist (SS) and Dr. D. Dhingra, Sr. Scientist visited National Horticulture Board (NHB) Gurgaon on 29th April 2008 and discussed the possibility of funding for mass production and multiplication of CIPHET developed “CIPHET Banana-comb cutter”. They had interaction with Sh. N. C Mistry, Addl. Managing Director, Sh. D. P. Singh and Sh. P. K. Singh, Deputy Director, NHB, Gurgaon. The tool “Banana-comb/ hand cutter” was demonstrated and explained. The tool was appreciated and NHB has shown interest in promoting it in the banana growing areas. They suggested that CIPHET may submit a proposal to NHB for funding under their appropriate scheme so that CIPHET Developed Banana-comb/ hand cutter can be multiplied and distributed to the beneficiaries. CIPHET has submitted project proposal to NHB Gurgaon for funding under the scheme “Technology Development and Transfer for Promotion of Horticulture”. Title of the project was ‘Multiplication, field demonstration and distribution of “CIPHET Banana-comb / hand cutter”’. Project investigators are Dr. Dattatreya M. Kadam, Scientist (SS) and Dr. D. Dhingra, Sr. Scientist as Co-PI. Project duration is 1 year starting from June 2008 to May 2009. Total financial assistance sought from the NHB board is Rs 9 lakhs.

EDP on Processing of Ginger, Garlic and Onion

An entrepreneurship development program on "Ginger, Garlic and Onion powder making technology" was organised at Central Institute of Post Harvest Engineering and Technology (CIPHET) Ludhiana during 15-21 May 2008. The programme was inaugurated by Dr. R.T. Patil Director, CIPHET. Twenty-five participants from Maharashtra, Sikkim and Punjab attended the programme. Out of twenty five participants nineteen were ladies. The topics namely chemistry of onion, garlic and ginger, theory of drying, machines and equipments for slicing, peeling, drying and milling, quality standards of dried ginger garlic and onion, FPO etc were covered. Apart from attending lectures, the participants processed ginger, garlic and onion into powder and other value added products. The EDP was co-ordinated by Dr. D. Dhingra & Dr. D.M. Kadam.



Participants of EDP on "Ginger, Garlic and Onion powder making technology" at CIPHET Ludhiana during 15-21 May 2008.

संस्थान में हिन्दी की मासिक कार्याशाला एवं संगोष्ठी

हिन्दी की मासिक कार्याशाला एवं संगोष्ठी के अंतर्गत दिनांक 27.05.2008 को संस्थान के सभा कक्ष में डॉ संगीता चोपडा, वरिष्ठ वैज्ञानिक द्वारा “जैव ईंधन के गैसीकरण से उत्पन्न ऊर्जा” विषय पर प्रस्तुतीकरण किया। जिसमें संस्थान के निदेशक, सभी समन्वयक, प्रभागाध्यक्ष, प्रभारी अनुभाग, प्रशासनिक, तकनीकी एवं सहायक अधिकारी व कर्मचारी उपस्थित थे।

Transfer of Porous Brick Technology

The porous bricks developed at CIPHET using crop residue as one of the ingredients were found very effective in construction of evaporative cool rooms for short term storage of fruits and vegetables due to their higher evaporation rate without compromising on the strength required for such structures. The technology on ‘Method of preparation of Porous Bricks’ was transferred to M/s Rajinder Dev & Co. Village Bhanohar, P.O. Mullanpur, Ludhiana on 29 May 2008. An agreement for licensing of knowhow of Porous Bricks was signed between CIPHET (ICAR) and the contracting party M/s Rajinder Dev & Co.



The technology on 'Method of preparation of Porous Bricks' was transferred to M/s Rajinder Dev & Co. Village Bhanohar, P.O. Mullanpur, Ludhiana on 29 May 2008.

Transfer of Evaporative Cooled Room Technology

The 5-7 tonne capacity evaporatively cooled storage structures designed and developed at CIPHET is a low cost short term low temperature storage solution for horticultural crops. The CIPHET has developed a set of construction drawings for this unit and it is given free of charge to the members of CIPHET advisory consultancy group. The technology for construction of Evaporative Cooled room was licensed to Motion of Integrated Technology for Rural and Agricultural (MITRA) Nayaka Gaon, Dharamsala Road, Sasaram- 821115 on, 9th May 2008. An agreement for licensing of knowhow of CIPHET Evaporative Cooled Room was signed between CIPHET (ICAR) and MITRA (Contracting party).



The technology for construction of Evaporative Cooled room was licensed to Motion of Integrated Technology for Rural and Agricultural (MITRA) Nayaka Gaon, Dharamsala Road, Sasaram- 821115 on, 9th May 2008.

Members of CIPHET advisory consultancy group for May 2008

The CIPHET has initiated a advisory consultation group for interested agro processing entrepreneurs. The membership for such a group is Rs. 1000 per year and entrepreneurs can benefit from expertise of CIPHET scientists, technicians, library collection and laboratory facilities to upgrade their existing technology/business to make it more efficient. Two entrepreneurs Sh. Paras Nath Upadhyay and Sh. Anil Kumar Gupta were registered for one year for advisory consultation during the month of May 2008. Sh. Paras Nath Gupta is a Chairman, Motion of Integrated Technology for Rural and Agricultural (MITRA), Naika Gaon, Dharshala Road, Sasaram – 821115 (Bihar). Sh. Anil Kumar Gupta is M.D of Hoshiarpur Roller Flour Mills Pvt. Ltd., Bye-pass Naloyan, Hoshiarpur – 146001

Technology of the month

Modified atmosphere packaging of different vegetables

Modified atmosphere (MA) is a unique technique to extend the shelf life and maintain the freshness of minimally processed vegetables. The MAP assures continuous interaction between respiration of packaged produce and gas permeability characteristics of the polymeric film package under a specified environmental condition of temperature and relative humidity. Besides controlling the produce metabolism, this technique reduces the activity of pathogenic bacteria. Mostly, single layer films like Polypropylene (PP), Oriented polypropylene (OPP) , Oriented Polysterene (OPS) and Low density/high density polyethylene (LDPE/HDPE) are used for vegetable packaging and recently, highly permeable films and micro-perforated films are used for packaging of vegetables. However, the problem with the LDPE and HDPE is that water accumulates in these packages. For this purpose, either micro-perforated films can be used or macro-holes can be made in the package which needs to be standardized for the individual vegetable. However, micro-perforated film packages are expensive and are not easily available; therefore macro-perforations using small pin-hole technique are better alternatives for this purpose. The size of the package should be selected in such a way so that the gaseous equilibrium remains non-fermentative during the entire period of storage under MAP. In case of non-perforated, about 30% space above the filled vegetable should be empty. On the other hand, in case of perforated packages, the headspace should be around 15% of total package volume.

At CIPHET, Ludhiana, the parameters like type of packaging material, size of bag, micro perforations required for exchange of gases as well as specific pretreatment required prior to packaging have been standardized. The shelf-life of various vegetables have been found to increase sufficiently using this technique. Some of the examples are as follows:

1. Okra or lady finger which has the problem of blackening and flaccidity during its storage can be stored for 9 days using this technology in macro-perforated PP film packages.



2. Broccoli which has a normal shelf life of 2-3 days can be stored using modified atmosphere packaging technology for 7-8 days in macro-perforated PP film packages in the winter season keeping all its bioactive constituents intact.



3. The shelf-life of betel leaf which is a commercial crop of immense national importance can be extended to 13 days in non-perforated PP packages at the retail level without development of harmful pathogens which is much more than 3-4 days storage at retailer's level through regular sprinkling of water.



4. The leafy vegetables such as spinach and mustard leaves; along with an additional shelf-life by 4-5 days have been found to retain their green colour (chlorophyll), turgidity and other physico-chemical attributes through packaging in non-perforated PP film packages.



At CIPHET we offer one week training programme for upcoming entrepreneurs and extension personnel on this technology for different crops. The training mostly includes hands on experience with MAP and testing of quality parameters.

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