



Central Institute of Post Harvest Engineering & Technology Ludhiana

OUR SLOGAN: PRODUCE, PROCESS AND PROSPER

CIPHET E – Newsletter for September 2010

Vol. 5 No. 9

Director's Column



Dear All

I am very happy to present to you 51st issue of our E-newsletter and thank you all for your kind support and encouragement in our effort to improve the post harvest sector.

Now-a-days along with food security the nutritional security also has become a concern in India. This is because deteriorating soil health is having its ill effect on the lowering the nutritional quality of foods produced. Similarly indiscriminate use of chemicals (fertilizers) to grow the crops and to protect them (pesticides) has posed the problem of food being harmful than life saving. To bring out the policy paper to solve these problems and enrich our crops and products in nutrition a brain storming session on Prioritization and Value Addition of Nutritionally Important Crops was held at NAAS. The issues discussed were varietal improvement of fruits and vegetables, fortification of cereals, pulses, oil seeds, importance of nutraceuticals, use of soy-protein, soya products, health of soils and livestock, bio-fortification and emerging processing technologies. The policy formed as an outcome of the deliberations will be useful for future course of action.

Noni (*Morinda citrifolia*) is a fruit of Indian origin which has caught the attention of processors and promoters lately and grand World Noni Congress was evidence of that. It is rich in phyto-chemical and offers great scope for export of value added products hence modern and emerging technologies to process Noni need to be explored. Scientists from CIPHET attended 'All India Seminar on Engineering Interventions to Enhance Income of Small and Marginal Farmers' (The Institution of Engineers, Delhi State Centre), national seminar on 'Engineering Agriculture for Evergreen Revolution' (ISAE, AP Chapter) and three day national bilingual conference on 'Agrionics & Food Processing Instrumentation' (CSIO, Chandigarh). CIPHET organized a winter school on 'Novel Techniques in Food Processing, Co-Products Utilization and Quality Assurance' and three days training programme on 'Micro- Processing and Packaging' for specially for subject matter specialists of KVK's and a training program on Post Harvest Technology for Rural Catchments for farmers/rural entrepreneurs from Assam. In a unique initiative, prisoners of the Ludhiana Central Jail were imparted training on extrusion technology for production of snack foods & pasta. Hindi *Pakhwara* was celebrated during this month. During the Hindi *Pakhwara* events such as essay writing, poster presentation, debate, poem recitation and seminar in Hindi language were organized.

Dr. Manjit Chinnan, from University of Georgia visited CIPHET and delivered a guest lecture on 'Developing new food technologies and transferring them to private sectors'. The institute also interacted with MoFPI for constitution of National Soya Food Processing Board. A unique facility of cryogenic grinding was established at CIPHET with a unit imported from Germany.

Wishing you all a very Happy Diwali

With best regards

**R.T. Patil
Director**

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Brain Storming at NAAS on Prioritization and Value Addition of Nutritionally Important Crops

This brainstorming Session was organized by National Academy of Agricultural Science, New Delhi on 18th September 2010. Dr. Mangala Rai, President NAAS and Former DG ICAR was the chief guest. Dr.Mangala Rai talked about the poor health of our soils which is affecting productivity and quality of the produce. He stressed that scientist should look into the methods of improving AA profile, fatty acid profile of the crops, processing methods should be such to prevent losses of vitamins & micro-nutrients, agro-industrial waste should be converted into food/ feed & agronomists should work on ways to improve health of soils. The technical sessions covered presentations on cereals, pulses, prospects of enhancing grain micro-nutrients in cereals, plants metabolism based research for nutraceutical crops,

improving nitrogen use efficiency of plants, farm based food processing, value addition of nutritionally important food grains, foods from microbes & food fortification etc.

The sessions were moderated by Dr. G. Ravi Shankar, Dr. (Ms) Mehtab Bamji, and Dr. K.L. Chadha. Dr. H.P. Singh, DDG (Horticulture) and Dr. Swapan Kumar Datta, DDG (Crop Science) also participated in the brainstorming meeting. From CIPHET Dr. RT Patil and Dr. Dhingra attended this meeting and contributed a presentation on “Emerging processing technologies for nutrition enhancement and preservation”.

The important issues discussed and outcome of Brainstorming Session was as follows:

- Focus should be on increasing the consumption of leguminous vegetables and tubers.
- Fortification of cereals, pulses, oilseeds through genetic engineering should be taken up.
- Varietal improvement of fruits and vegetables should be done to improve their processing characteristics (e.g. tomatoes with high TSS, mango with improved flavors/color).
- Research on nutraceuticals and their clinical trials should be taken up.
- Efforts should be made for lifting ban on Lathyrus and its varieties with low ODAP content may be cultivated in marginal lands. It will add 3-5 million tons of pulses in annual production.
- Use of soy-protein / soy-fortified atta may be promoted.
- Health of soils as well as animals/ livestock should be given importance.
- Nutritional security has to be horticultural centric.
- Bio-fortification of Fruits and Vegetable crops.
 - *Transfer genes to potato/ tomato for protein.
 - *Enrichment of cauliflower with beta- carotene, etc.
- Breeding work may be intensified to develop nutritionally rich crops.
- Utilization of un-polished rice to be looked into as it is more nutritious.
- Whole country should have storage facilities for food crops.
- Earlier all policies revolved around Wheat & Rice only, but now wheat, rice, banana, potato and tubers have been noticed for food security.
- Consistent value added products with well defined standards may be promoted.
- Adoption of recent advances and emerging technologies in food processing should be taken up to prevent deterioration in quality during processing.

World Noni Congress-2010

Noni (*Morinda citrifolia*) is a tree in the coffee family, Rubiaceae. Noni fruit powder is high in carbohydrates and dietary fiber. Noni fruit contains a number of phytochemicals, including lignans, oligo- and polysaccharides, flavonoids, iridoids, fatty acids, scopoletin, catechin, beta-sitosterol, damnacanthal, and alkaloids. Dr. RT Patil attended World Noni Congress at Chennai and Co-chaired the Technical Session-VIII-Product Diversification and Value Addition alongwith Dr. B.S. Bisht as Chairman and Dr. M.M. Anwar as Co-chair. The following papers were presented in the session:

1. Standardization of recipes acceptability of Noni fruit
2. Studies on preparation of Noni fruit
3. Studies on effect of carbonation on nutraceutical profile of Noni Juice
4. Standardization of technology for preparation of cookies enriched with Noni powder.

The parallel development of post harvest management and value addition along with scientific cultivation has resulted in the remarkable prosperity to the Noni growers, processors and consumers. Since Noni is a product of Indian origin and recognized world over for its health benefits, it offers great scope for export of products made from Indian Noni. Dr. Patil therefore advocated application of modern and emerging technologies to process the Noni and its value added products.

Engineering Interventions to Enhance Income of Small and Marginal Farmers

The Institution of Engineers (India), Delhi State Centre organized All India Seminar on “Engineering Interventions to Enhance Income of Small and Marginal Farmers” under the aegis of Agricultural Engineering Division Board of IEI during September 29-30, 2010 at Institution’s premises, New Delhi. The Seminar was inaugurated by Prof. B S Pathak, Former Director, Sardar Patel Renewable Energy Research Institute (SPRERI), Vallabh Vidya Nagar, Gujarat, Prof. Anwar Alam, Former Vice-Chancellor, Sher-e-Kashmir University of Agriculture Science & Technology (SKUAS&T), Srinagar was the Guest of Honour. Dr. M. M. Pandey, DDG (Engg.), ICAR was the Chairman, Technical Committee of the Seminar. Drs. RT Patil, R. K Gupta, D.R.Rai, Balasubramanian and Dr. Sangeeta Chopra from CIPHET attended the seminar and presented the work done at CIPHET in post harvest sector.

Engineering Agriculture for Evergreen Revolution

The national seminar on “Engineering Agriculture for Evergreen Revolution” was organized by ISAE (AP Chapter) in association with Acharya N G Ranga Agricultural University and Central Research Institute for Dryland Agriculture (ICAR), Hyderabad at Sri Venkateswara Veterinary University Auditorium, Tirupati during September 24-25,2010. The inaugural function was attended by the two state ministers namely, Sri N Raghuvveera Reddy, Hon’ble Minister for Agriculture, Horticulture and Sericulture and Sri Ponnala Laxmaiah, Hon’ble Minister for major and Medium Irrigation, Govt of Andhra Pradesh who was chief guest of the session. The inaugural session was presided by the Hon’ble Vice Chancellor, Dr P Raghava Reddy, ANGRAU, Hyderabad. Sri Ravindra Sannareddy, Managing Director, SRI CITY, SEZ-DTZ, Nellore was special Guest of Honor in the function. The other guests of honor included Dr Gyanendra Singh, Ex Vice Chancellor, MGGVV, Chittrkoot, Madhya Pradesh and Dr V M Mayande, Hon’ble Vice Chancellor, Dr PDKV, Akola. Dr T V Satyanarayana, Dean (Agril.Engg. & Technology), ANGRAU, Dr I M Mishra, Secretary General, ISAE, New Delhi and Sri T Vijaya Bhaskar Reddy, General Secretary, ISAE (AP Chapter) were present on the occasion.

Dr. K.Narsaiah, Senior Scientist, AS&EC Division, attended and presented a paper titled Engineering and Technological Interventions for Indian Meat Industry. Work done at CIPHET in on equipment development for small and medium entrepreneurs of meat industry and glimpses of work on animal comfort systems and product development were also presented.

Winter School on Novel Techniques in Food Processing, Co-Product Utilization and Quality Assurance

A 21-day long ICAR winter sponsored winter school on "novel techniques in food processing, co-product utilization and quality assurance" was organized CIPHET during Sept 1-21, 2010. Dr. Rakesh Tuli, Executive Director, National Agri Biotechnology Institute, Chandigarh was Chief Guest for inauguration. Speaking on the occasion, Dr Tuli said that there was need to develop technologies which meet local needs and was happy that CIPHET was working in this direction. He was happy to see many researches from CIPHET reach end users/farmers which otherwise was not



Dr. Rakesh Tuli addressing the participants during the winter school at CIPHET



S.S Dhillon distributing certificate to the participant of the winter school at CIPHET

possible by many institutes. Saying that development of technology and acceptability are two different things, he said that post harvest was most critical area for increasing farmers income as agriculture production had almost entered phase stagnation in our country. Only hope is to increase income of farmers through value addition, he added.

The 21-day long programme included trainings in Novel process technology for underutilized plant food, application of nano technology for packaging of food products, modeling procedure for green house environment for various applications, novel packaging for fresh and minimally processed food.

The chief guest for concluding session of this winter school was Er. S.S Dhillon, Director Micro Small and Medium Enterprises (MSME), Ludhiana. He informed that that government of India has number of schemes for small and made scale enterprises; however government focus was on two major areas. "First, it is on the manufacturing sector and second is on the food processing industry, which could generate lot of employment," he said, adding that CIPHET like institutes could play a very important role in this. He added that government of India had planned to spend Rs 50 thousand crore on skill development and this would not happen without cooperation of experts from different fields.

Training Programme on Micro-Processing and Packaging for KVKs

A 3-day training programme on micro-processing and packaging for North Zone KVKs was organized at CIPHET during Sept 2-4, 2010. It was inaugurated by Zonal Director Dr A.M Narualla. Addressing Subject Matter Specialists of KVK's who were the participants Dr Narualla said that so far condition of country was not to level of



Inaugural session on Micro-processing and packaging of fruits and vegetables at progress at CIPHET

satisfaction in micro-processing and packaging. “There is a huge section of the country which want graded and packaged food. But market is lying untapped due to lack of packaging and processing facilities at village level,” he said, adding in India farm sector was also facing shortage of labour. “This could only be taken care of by fast mechanization of processing and packaging,” he said, advising subject matter specialists to create awareness about post harvest processing in their respective regions.

Ludhiana Central Jail Prisoners Get Training in Extrusion Technology

Prisoners of the Ludhiana Central Jail were imparted training in extrusion technology for production of snack foods and pasta making technology by the experts of CIPHET on Sept 7, 2010 as part of CIPHET initiated a unique training programme for Prisoners. The aim is to train them to earn respectful living after they get released from the jail. CIPHET developed extrusion technology for production of breakfast cereals and other snack from maize, rice brokens and wheat was demonstrated to them. Also, they were given practical demonstration for making pasta, which was becoming very popular especially among the youth. Deputy Jail Superintendent S.S Sahota showed optimism that atleast some of the prisoner would find their future into food processing.



Prisoner of Ludhiana Central Jail trying his hand on extrusion machine with CIPHET scientists

Post Harvest Technology for Rural Catchments for Assam Farmers

A week-long training program on ‘Post harvest technology for rural catchments’ for farmers sponsored by the State Institute of Rural Development (SIRD), Assam, was organized at CIPHET during Sept 9-18, 2010. The aim of the program is to train farmers & upcoming rural entrepreneurs in post harvest technologies and increasing their income through value addition.

Speaking on the occasion of inauguration, Dr R.T Patil, Director CIPHET, encouraged the farmers to explore the tremendous opportunities emerging in post harvest with demand for processed food was gaining momentum in the urban centers. “The entry of top corporate houses including Reliance in selling vegetables and processed food give us enough reasons to believe, it is a high profit market. The market has also grown up bigger with increasing income and shrinking time with people in cities,” said he, adding that processing of food is always not difficult as one perceives.



A Delegation of Assam farmers with CIPHET faculty

“For converting raw material into processed food does not require a big science. More than that practice is required. At CIPHET we will provide technical know-how, hands on experience and confidence to farmers,” Dr Patil said, “Arrival of the MNC’s in food processing is also in favor of farmers. They are charging hefty prices from customers. This has raised the perception value for processed food items in the mind of customers and now farmers processing food would also get value for their products.

The programme was coordinated by Dr Deepak Raj Rai, Head, Transfer of Technology Division, and Dr Sangeeta Chopra, Senior Scientist. Training program included processing and value addition of groundnut and soybean, concept of agro processing for rural production catchments, food packaging for rural catchments, meat processing technologies, processing and value addition of beetroot and carrot, low coast storage of fruits and vegetables and processing of rice and byproduct utilization etc.

Hindi Pakhwara at CIPHET

For promoting the national language Hindi, Central Institute of Post Harvest Engineering and Technology celebrated Hindi Pakhwara during Sept 14-28, 2010. Speaking on the occasion, CIPHET Director Dr R.T Patil said like national anthem, bird, national language had also its own importance. He said that one should be proud of his national heritage and language. Dr S.K Nanda, Project Coordinator CIPHET, spoke on status of Hindi and its use in the country. In her welcome address, Dr Mridula Devi, Senior Scientist, revealed that on September 14, 1905 Hindi was declared the official Language of the Indian union. She also read the speech of Union Minister for Agriculture Sharad Pawar on promotion of Hindi. Head, ASEC Division, Dr. S. N. Jha stressed the need to give due importance to Hindi. The consensus was evolved that research papers should also be published in Hindi and its use should be extended to conference and seminars. During the Hindi Pakhwara, competitions of typing, essay writing, poster presentation, debate, poem recitation, scientific discussion, impromptu speech, etc were held.

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Developing New Food Technologies and Transferring them to Private Sector

Advocating earlier engagement of entrepreneurs in research projects, Dr Manjit Singh Chhinnan from University of Georgia, called for need to understand consumers before developing any product, while delivering a guest lecture on “Developing new food technologies and transferring them to private sector” at the Central Institute of Post Harvest Engineering and Technology (CIPHET) on Sept 15, 2010..



Dr Manjit Singh Chhinnan from Georgia University addressing CIPHET scientists

Emphasizing that multidisciplinary coordination is required for developing commercially viable food products, Dr Manjit Singh Chhinnan, said that transfer of technology was the most crucial aspect for success of any product. “85 percent products developed in laboratories never gets market acceptance and only 10 percent of products out of 15 percent accepted by the market remains on shelf of stores after one year,” he tried to establish that developing products to market expectation was never easy. “Very few products succeed,” he added. Chhinnan said that they adopt mainly three approaches for transferring of technology in US. “When the entire research is funded by public money, then we provide information available to everyone. In case of partial funding from industry, we keep information delayed for public domain to benefit the sponsor. In certain cases where entire funding is from industry exclusive rights were issued.”

CIPHET Scientists Participated in CSIR Golden Jubilee Celebrations

Scientists from Central Institute of Post Harvest Engineering and Technology (CIPHET) participated in the three-day national bilingual conference on agrionics and food processing instrumentations held at Central Scientific Instruments Organisation (CSIO), Chandigarh during Sept 26-29, 2010. This event was organised as a part of CSIR’s golden jubilee celebrations.

CIPHET Head Transfer of Technology Division, Dr Deepak Raj Rai, Senior Scientists Dr Sangeet Chopra and Dr H.S Oberoi delivered lectures in their respective expertise. The objective of the conference was to create awareness among stakeholders on agricultural instrumentation, food processing equipment and preservation technologies so as to bridge gap in meeting challenges in state of the art concepts and affordable solution for this important sector.

CIPHET Director Dr. Patil also participated in the Foundation day celebrations of Council of Scientific and Industrial Research (CSIR) held at its unit Mechanical Engineering Research and Development Organization (MERADO) at Ludhiana on Sept 26, 2010. While speaking on the occasion Dr. Patil lauded the role of CSIR in development of agricultural mechanisation in Punjab and in the country especially for reduction in the size of the tractor appropriate to Indian agro economic conditions. He said that role of mechanisation is equal to the total agricultural inputs together in bringing the green revolution into reality.

CIPHET Procures a Unique Facility of Cryogenic Grinding from Germany

India is the store house of spices i.e. Black pepper, Chilly, black pepper, Coriander, Turmeric, Fenugreek and Cinnamon etc. During the grinding of spices, generated heat causes temperature rise in the grinder and final product to the extent of 95°C which is responsible for the loss of volatile oil colour and aroma in the tune of about 30% and imparts dark color. Also, a continuous operation of grinder is not possible in normal grinding process due to melting of fat and stickiness of powder on the grinding surfaces. The introduction of low temperature through cryogenic grinder retains the flavour, color, aroma essential oil and medicinal properties.



Cryogenic grinder

Under NAIP sub project “Studies on Cryogenic Grinding for Retention of Flavour and Medicinal Properties of Some Important Indian Spices”, CIPHET, Ludhiana has procured a laboratory model cryogenic grinder (Model: 100 UPZ, Cost Rs.41.50 lacs) from Hosokawa Alpine, Germany. The feeding capacity of grinder is 2 kg/h. This cryogenic grinder has the state of the art facilities. The low temperature using liquid nitrogen causes the feed material to become brittle. The specific precrushing energy is reduced meaning that achieves high levels of grinding performance. Cryogenic grinder (pin mill and hammer type) allows uniform size reduction, lower energy-consumption, less wear and tear of equipment. It yields particle sizes down to 10 micron and is primarily used for functional foods and pharmaceutical applications.

MOFPI to Set up National Soya Food Processing Board

A meeting was held on Sept 23, 2010 for consultations on constitution of National Soya Food Processing Board (NSFPB) under the chairmanship of Shri Amrit Lal Meena, Joint Secretary, Ministry of Food Processing Industries (MFPI). The other invited participants were Dr Pitam Chandra, Director, CIAE, Dr S K Srivastava, Director and Dr Vineet Kumar from Directorate of Soybean Research, Indore, Dr Suresh Itapu, ED, Soy Food Promotion and Welfare Association (sitapu@soyaindia.org); Dr Rattan Kumar Sharma, Technical Director – human Nutrition(Soy fortification) ASA-IM (rsharma@asaimasc.org); Mr Vivek Kacker, MD, Faith Foods Pvt. Ltd.; Mr Praneet Mutha, Director, Vippy Industries Ltd.,pm@vippysoya.com; Mr V K Jain, Director, Ruchi Soya Industries Limited (vk_jain@ruchigroup.com), Mr Raj Kapoor, Dr Deepti Gulati, Mr Amit Thakkar, Prestige Industries (09820084819), Dr J S Pangaria, SOPA, a representative from National Oil seeds and Vegetable Oil Board, Gurgaon. Dr. Dhingra, Sr. Scientist attended this meeting and informed the group about CIPHET activities related soybean processing and entrepreneurship development.

Technologies Licensed To Entrepreneurs during Sept. 2010

- 1. Green Chilli Powder** was licensed to Farm Green Company 17/41 Singhpura Mohalla, Near jagraon Bridge Ludhiana on 20-09-2010.

2. **Onion, Ginger and Garlic powdering technology** was licensed to Mr. Vijay. U. Pankadi E-90, Balaji Nagar, Behind Sindhi Colony Aurangabad-431005 and Mr. Dilip B. Sangle A/P Shedgaon, Tal-Sangamner Dist. Ahmednagar (MH) on 27-09-2010.
3. **Advisory consultancy membership** was offered to Mr. Anil K. Gupta Hoshiarpur Roller Flour Mills Pvt. Ltd. By-Pass Naloyan Hoshiarpur.

Joining, Transfer and Promotion

Joining



Dr Rahul Kumar Anurag joined as a Scientist (Food Science & Technology) in ASEC Division, CIPHET Ludhiana on 18th Sep 2010. He has completed his Master and Doctorate from G B Pant University of Agriculture and Technology, Pantnagar in 2004 and 2008 respectively. He worked on optimization of ripe mango powder using vacuum and freeze drying. He has also served in Centre of Food Science & Technology, Institute of Agricultural Sciences BHU, Varanasi, UP.

Transfer

Sh. J.S. Paul, Assistant Administrative Officer has been transferred at CIPHET, Abohar w.e.f. 21-09-2010.

Promotion

Sh. B.C. Katoch has been promoted from Assistant to the post Assistant Administrative Officer and Sh. Kunwar Singh & Sh. Avtar Singh also have been promoted from Upper Division Clerk to the post of Assistant w.e.f 06-09-2010 respectively.

Job Opening

1. One post of Senior Research Fellow (SRF) under DBT sponsored project on **Development of technologies for pelletization, delignification and saccharification of cellulosic biomass such as rice straw, cotton stalk, sweet sorghum, switchgrass, *Prosopis julifera* and *Lantana camara***

Contact: **Dr. Harinder Singh Oberoi**, Principal Investigator, & Sr. Scientist, AS& EC Division, Phone : 0161-2313126 Email : hari_manu@yahoo.com, vkbciphet@gmail.com

The further details are available on CIPHET website www.ciphet.in

2. One Research Associate (RA) in a sub-project of Department of Science & Technology (DST) on **Efficient expelling and extraction of oil from seeds and utilization of deoiled cake.**

Contact: **Dr. Mridula D.**, Senior Scientist & Principal Investigator, FG & OP Division, CIPHET, PO: PAU Campus, Ludhiana-141004 (Pb), Tel No. 0161- 2313127; Fax: 0161-2308670; (M) 09417538017

The further details are available on CIPHET website www.ciphnet.in

Announcement

Paid Training Programmes at CIPHET

1. One week Training on “**Ultraviolet, Visual and Near Infra Red Spectroscopy Methods and Data Analysis for Evaluation of Foods and Biomaterials at Commercial Level**” during Nov 19-26, 2010.
2. One week Training on “**Micro Encapsulation Methods for Food and Biotechnological Applications**” during Dec 2-8, 2010

Contact: Dr. S. N. Jha, Head, AS& EC Division, Phone : 0161-2313109
Fax : 0161-2308670, Email : snjha_ciphnet@yahoo.co.in Or Dr. K. Narsaiah, Sr. Scientist, AS & EC Division, Phone : 0161-2313124, Email: knarsan@yahoo.com

The details of the course are available on CIPHET website www.ciphnet.in

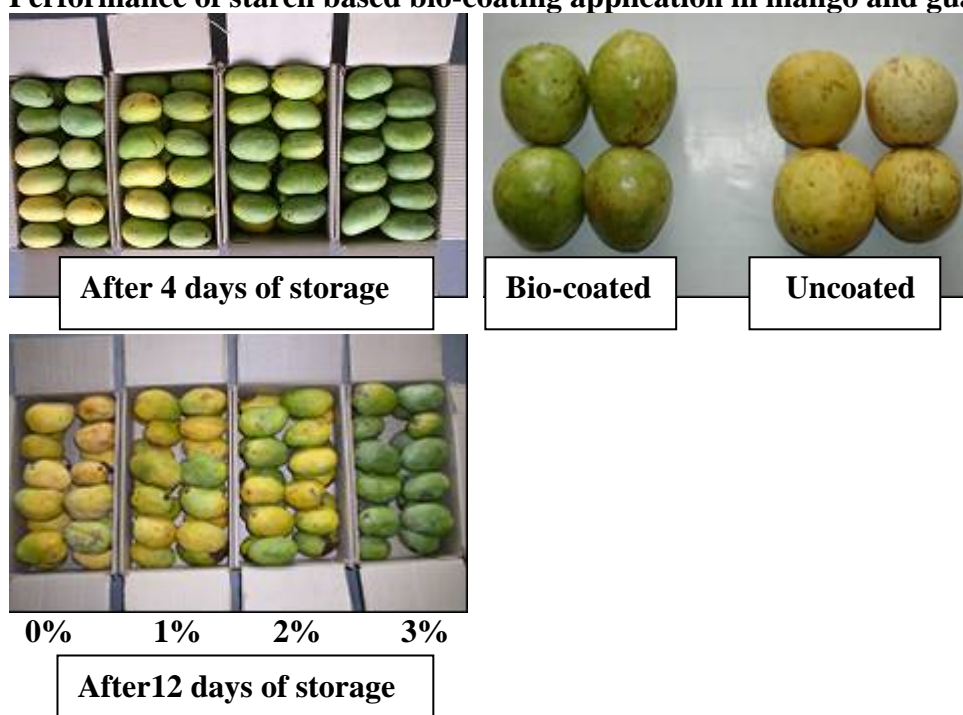
Technology of Month

Starch Based Coating for Extending Shelf Life of Mango and Guava

Fruits like mango and guava are highly perishable and large quantities of these fruits are lost every year due to spoilage within a few days. This short period limits the long distance commercial transport of these fruits. The predominant methods used to preserve fresh fruits during handling and marketing includes CA and MA storage techniques in conjunction with the refrigerated storage which are capital intensive and costly to run. Although a cheaper system of extending the shelf life of fruit is the use of wax coating but earlier work using mineral oils in producing edible coating was largely unsuccessful because it reduced the gaseous exchange and caused anaerobic respiration. Therefore CIPHET has come up with some alternative edible coating materials from rice, cassava, chitosan and turmeric by developing starch based edible bio-coating. These bio-coating were tested for their effects on external and internal quality parameters of fruits like mango and guava. The study has established the necessary conditions to prolong the post harvest life of mango and guava using various starch based coatings. These coatings created modified atmosphere with less expense, reduced decay and improved the gloss by imparting a subtle shine. The incorporation of brightness due to the use of coating had a favourable effect on fruit appearance. Application of gelatinized starch produced filmogenic coating similar to the cellulose in resistance and transparency, representing a potential alternative for conservation of fruits and vegetables under ambient condition. All starch based bio-coating retarded colour development and retained greater firmness values in coated fruit compared to control as well as wax coated fruit.

In this technique, the fruits were dipped in the starch based solution, dried by air and conserved at ambient temperature. The formation of starch film or bio-coating is based on the principle of gelatinization of starch that occurs above certain temperature with excess of water. After cooling, it forms a transparent film which had its properties of biodegradable product and it plays the same function of the plastic film in creating modified atmosphere. These coating are less permeable to respiratory gases such as O₂ but are more permeable to water vapour compared to commercial wax coatings and other plastic covering material. Among various coatings, chitosan and cassava starch were found most effective in delaying fruit ripening and increasing the concentration of flavour volatiles. Chitosan based coating was found superior in checking some fungal decay and can be used as a substitute of the current fungicide highly harmful to the environment and to the health of human being. The bio-coating containing 3.0% cassava starch produced at par results with 2.0% chitosan starch solution in delaying the fruit ripening. Thus cassava starch could be used as a most promising coating material in extending the shelf life of fruits. It has good film forming quality and is much cheaper than chitosan and other waxes. Also it is edible and coating can easily be prepared at home. The shelf life of the fruit can be extended to 3-4 days under ambient condition. Developed bio-coatings presented beneficial effect in maintaining the fruit firmness even after 8 days of ambient storage and the fruits were well accepted by the consumers at the end of storage period. Though these coating were quite effective in delaying the fruit ripening but their effect on weight loss was not quite significant; thereby requiring more studies on the formulation of coatings in order to further reduce the weight loss.

Performance of starch based bio-coating application in mango and guava



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