Training Workshop on Characterisation of Fresh and Processed Fruit Quality

Jointly organised by Nong Lam University, Hochiminh City, Vietnam and Centre for Underutilised Crops, University of Southampton funded by Leverhulme Trust

Vietnam, 23-25 July 2012

The Research Institute of Biotechnology and Environment (RIBE) at Nong Lam University, Ho Chi Minh City, Vietnam, and the Centre of Underutilised Crops (CUC) at the University of Southampton are jointly offering a three day (July 23-25, 2012) research training workshop funded by the Leverhulme Trust. The workshop is focusing on promoting cutting edge research and innovation under the project **"International network on preserving safety and nutrition of indigenous fruits and their derivatives"**.

Workshop objectives:

- To promote research into the characterisation of sensory, nutritional and functional qualities of fruit quality by providing training in analytical methods.
- To highlight the nutritional potential of some indigenous fruit in Vietnam and show how techniques developed for the exotic fruit industry could be applied to indigenous fruit.
- To strengthen and extend the existing network. This will be achieved in two ways:
    - By participating in the workshop, network partners will become familiar with each other's capacities and special interests in the field of characterisation of fruit quality.
    - By including new individuals from partner institutions and from Vietnam, the network will be extended.
- To provide an opportunity for partners to identify research gaps in the area of sensory, nutritional and functional characterisation of indigenous fruit.
- To enable partners to agree on promising research areas and initiate research proposals in the area of characterisation of indigenous fruit.

Training will be provided by staffs from the Faculty of Food Technology, and from the RIBE, Nong Lam University. In addition our other partners will also present papers on relevant subjects. The workshop will comprise a mixture of presentation sessions, class-room training and laboratory work in which the participants can gain hands-on experience. Each participant will receive handouts and guiding documents relating to the training.

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WORKSHOP PROGRAM

Time	Session/Activity Description	Chair/Speaker(s)
23th July **Day 1**	**PRESENTATIONS ON FRUITS AND INDIGENOUS FRUITS**	
08:30	Registration	
09:00	Representative introduction	Ms. Duong, Thi Ngoc Diep, NLU, Vietnam.
09:15	Welcome address	Dr. Nguyen, Hay, NLU, Rector
09:25	Introduction to the Workshop	Dr. Kathrin Schreckenberg, CUC, University of Southampton, UK
	Session : Fruits and indigenous fruits production	**Chair : Dr. Katherin Schreckenberg**
09:35	Potentiality of processed indigenous fruits and their derivatives for providing safe nutrition.	Dr. Susanta Kumar Roy, AU, India
09:55	An over view on fresh and processed fruits production in Cambodia.	Dr. Seingheng Hul, ITC, Cambodia
10:15	General discussion	
10:30 – 11:00	**COFFEE BREAK**	
	Session: Fruits and indigenous fruits quality	**Chair: Dr. Max Reynes**
11.00	Microbiological ecology of indigenous fruits in relation with geographical origin and/or production mode.	Mr. Jean Christophe Meile, CIRAD, France
11:20	Physico-chemical properties and current postharvest practices on main fruit varieties in the South of Viet Nam	Dr. Nguyen, Van Phong – SOFRI, Vietnam
11.40	Status of characterisation of Sri Lankan fruits	Dr. Pushpakumara, Dr. Dharmasend, and Mr. Gunawerdena

12.00	Quality assurance status and future perspective in fresh and processed fruits of Bangladesh.	Dr. M.G.Saha and Mr. M.M.Molla, BARI, Bangladesh
12.20	General discussion	
12:40 – 14.00	**LUNCH BREAK**	
	Session: Fruit antioxidants	**Chair: Dr. Susanta K. Roy**
14.00	Main class of polyphenols and antioxidants in indigenous fruits.	Dr. Max Reynes, CIRAD, France
14:20	Studies on extraction, characterization and antioxidant activity of anthocyanins extracted from plum pomace.	Dr. Shailendra K. Dwivedi, AU, India
14:40	NIRS and Its Applications In Assessment of Fruit Quality	Dr. Justine Phuong Boffo, CITAA, France
15.00	General discussion	
15:15 – 15:45	**TEA BREAK**	
	Session: Fruit quality characterization	**Chair: Dr. Le, Dinh Don**
15:45	Introduction about Nong Lam University	Dr. Le, Dinh Don, NLU, Vietnam.
16.00	Training: Application of High Performance Liquid Chromatography (HPLC) and Atomic Absorption Spectrophotometric (AAS) in nutritional assessment for fruits	Ms. Phung, Vo Cam Hong, NLU, Vietnam
16:30	Training: Sensory evaluation in characterization of fruit quality	Ms. Lam, Thanh Hien, NLU, Vietnam
17:00	**Day 1 workshop closing**	
24th July **Day 2**	**TRAINING AT LABS: FRUIT ASH AND VITAMIN ANALYSIS - FRUIT SENSORY EVALUATION**	
08:30	A short tour around the RIBE's labs	Dr. Le, Dinh Don, RIBE, NLU, Vietnam

09:00	On-site method training of ash and vitamin analysis by HPLC and AAS	Ms. Phung, Vo Cam Hong, NLU, Vietnam
09:30	Sample preparations for magnesium and vitamin C analysis (participants working in groups)	Ms. Phung, Vo Cam Hong, NLU, Vietnam
10:30	Sensory evaluation (participants working in groups)	Ms. Lam, Thanh Hien, NLU, Vietnam
12:00 – 13:30	**LUNCH BREAK**	
13:30	Running the ash and vitamin tests (participants working in groups)	Ms. Phung, Vo Cam Hong, NLU, Vietnam
15:00 – 15: 15	**TEA BREAK**	
15: 20	Tests result discussion	Ms. Phung, Vo Cam Hong, NLU, Vietnam Ms. Lam, Thanh Hien, NLU, Vietnam
17:00	**Day 2 workshop closing**	
25th July **Day 3**	**VIETNAMESE MARKET VISIT AND WORKSHOP CLOSING**	
7:30	Visit a Vietnamese traditional market in Hochiminh city.	
12:00 – 14:00	**FAREWELL LUNCH**	
14.00	Low Cost Storage Technology for Small Scale Farmers	Dr. Neeru Dubey, Amity University, India.
14.20	An overview on the quality of some indigenous fruits in North Vietnam.	Dr. Chu, Ky Son, HUT Hanoi, Vietnam
14.40	Market Access through Competency Based Education and Training in Horticulture	Mr. Le, Nguyen Doan Duy, CTU, Vietnam
15.00	E-learning programme on Post Harvest Technology	Ms. Naga Laxmi M. Raman, Amity University, India.
15.20	General discussion	

15:35 – 16:00	**TEA BREAK**	
16.00	**Workshop closing and certificate distribution**	Dr. Kathrin Schreckenberg and Mr. Hamid Malik, CUC, University of Southampton
16.15	Internal project discussion on mini-research and Cambodia workshop (continued)	Dr. Kathrin Schreckenberg and Mr. Hamid Malik, CUC, University of Southampton

List of Participants

Country	Sl No	Name of the Participant	Name of the Organisation
Bangladesh	1	**Dr. Modan Gopal Saha** Principal Scientific Officer mgs_60@yahoo.com.	Horticulture Research Centre, Bangladesh Agricultural Research Institute (BARI), Bangladesh.
	2	**Mr. Mohammad Mainuddin Molla** Scientific Office mainuddinmolla@yahoo.com	
	3	**Ms. Nazma Parvin Laizu** Entrepreneur (Managing Director) nokshi@yahoo.com nokshi787@gmail.com	SME- Nokshi Food Products, Savar, Dhaka
Cambodia	4	**Dr. Hul Seingheng** Director of Research, hul@itc.edu.kh	Institute of Technology of Cambodia, Cambodia
India	**5**	**Prof. Susanta Kumar Roy** Roysusanta2002@yahoo.co.in	Amity International Centre for Post-Harvest Technology and Cold Chain Management ,Amity University, Uttar Pradesh, India
	6	**Dr. Neeru Debey** needub@gmail.com	
	7	**Dr. Shailendra Dwivedi** skdwivedi@amity.edu	
	8	**Mrs. Naga Laxmi Raman** nlmraman@gmail.com	
Sri Lanka	9	**Prof. DKNG Pushpakumara** ngpkumara@pdn.ac.lk	Faculty of Agriculture, University of Peradeniya, Sri-Lanka
	10	**Prof. DAN Dharmasena** dand@pdn.ac.lk	Faculty of Agriculture, University of Peradeniya, Sri-Lanka
	11	**Mr. Chaminda R Gunawardan** crohan74@gmail.com	IPHT Research & Development Centre, Sri- Lanka.
France	12	**Dr. Max Reynes** max.reynes@cirad.fr	CIRAD, France
	13	**Dr. Jean Christophe Meile** jean-christophe.meile@cirad.fr	
	14	**Dr. Phuong Justine Boffo** jean-christophe.meile@cirad.fr	
UK	15	**Dr. Kate Schreckenberg** k.schreckenberg@soton.ac.uk	University of Southampton , UK
	16	**Ms. Sarah Hickman** sarahohickman@gmail.com	
	17	**Mr. Malik Hamid** m.a.hamid@soton.ac.uk	
Vietnam (Hosts)	18	**Ms. Duong Thi Ngoc Diep** ,Lecturer diepngocduong@yahoo.com	Nong Lam University, HCMC, Vietnam

	19	**Mr. Quang Hong Luong** ,Lecturer lhongquang@yahoo.com	
Vietnam (Local Participants)	20 21	**Ms Tong, Thi Thao Ngoc** **Ms. Phan, Thi Lan Khanh**	Nong Lam University, HCMC, Vietnam
	22	**Dr. Nguyen, Van Phong**	Research Institute of Southern Fruits (SOFRI), Vietnam
	23	**MSc. Le, Nguyen Doan Duy**	Can Tho University (CTU), Vietnam
	24	**Dr. Chu, Ky Son**	University of Technology, Hanoi (HUT), Vietnam
	25	**Mr. Ly Thong Vien**	SME, Verges- Mekong Company, Vietnam
Vietnam (Trainers)	26 27 28 29 30	**Dr. Le, Dinh Don** **MSc. Phung, Vo Cam Hong** **MSc. Lam, Thanh Hien** **Ms. Truong, Thi Bich Lieu** **Mr. Vo, Tran Kien**	Nong Lam University HCMC, Vietnam

Abstracts of Presentations

Potentiality of processed indigenous fruits and their derivatives for providing safe nutrition

Susanta K Roy

Professor Emeritus, Amity International Centre for Post-Harvest Technology & Cold Chain Management, Amity University Uttar Pradesh, Sector-125, Expressway, Noida, India.

Most of the indigenous fruits of the South-Asian region have the ability to grow under adverse conditions and are also known for their therapeutic and nutritive value. Because of their curative properties, these fruits have been used in traditional systems of medicine since time immemorial. In addition, quite a few of these fruits have excellent flavour and very attractive colour. There is always a market demand all over the world for new food products, nutritious and also delicately flavoured. Consumers today are becoming increasingly conscious of the health and nutritional aspects of their food. The tendency is to avoid chemicals and synthetic foods and choose therapy and nutrition through natural sources. The indigenous tropical fruits have an important role to play in satisfying these demands. Many of these fruits are highly perishable and difficult to market in the fresh form. Some of them are not easy to eat out of hand. A few are not acceptable as a fresh fruit because of high acidity and/or strong astringent taste. However, all these fruits have unlimited potentiality in their processed products developed following the food safety norms. Apart from safe processing and market demand, a strong campaigning is necessary to create awareness and consciousness among the producers and consumers of indigenous tropical fruits. The paper deals with the processing of some of the important indigenous fruits known for their nutrition and therapeutic properties which possess unquestionable potentialities.

An overview on fresh and processed fruits production in Cambodia

Seingheng HUL

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Tropical country like Cambodia provides a good opportunity for growing different kind of tropical fruits such as lychee, mango, longan, jackfruit, cashew, rambutan, durian…etc. GDP relies mainly on agriculture because 80% of the population belongs to this sector. The two season pattern of dry and rainy season together with low technical assistance for growing agricultural fruits are two factors explaining why the country does not have much fresh fruits and processed fruits to supply local, regional and international markets. According to the statistics shown by the Ministry of Agriculture, Forestry and Fisheries in 2010, the huge amount of mango is grown across the country with 23,734 hectares. The areas with many activities of fruit farming are Kompong Cham, Battambong, Kompot,

and Kompong Speu province. Recently, cashew plantations are also becoming interesting to farmers due to high local and regional market demand. This product in raw form is normally exported to the neighbouring countries. In general, it is noticed that fresh fruits are available seasonally in an excess amount and investments in post-harvest management have been slow. This may be due to instability of fruit yield in terms of quality and quantity, insufficient human resources on food processing technology, and socioeconomic factors. Therefore, the only manufacturing enterprises for food processing in Cambodia are small and medium-sized.

Keywords-Fruit yields, socio-economic factors, small and medium-size manufacturing Enterprise

Microbiological ecology of indigenous fruits in relation with geographical origin and/or production mode

Mr. Jean Christophe Meile

CIRAD, France

ABSTRACT NOT YET RECEIVED

Physico Chemical properties and current postharvest practices on main fruit varieties in the south of Vietnam

Dr. Nguyen, Van Phong

Research Institute of Southern Fruits Vietnam (SOFRI), Vietnam

ABSTRACT NOT YET RECEIVED

Market Access through Competency Based Education and Training in Horticulture

Mr. Le, Nguyen Doan Duy

Can Tho University, Vietnam

ABSTRACT NOT YET RECEIVED

Status of Characterisation of Sri Lankan Fruits

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[2] Institute of Postharvest Technology, Anuradhapura, Sri Lanka

In Sri Lanka, considerable genetic and species diversities of fruit trees exist in agricultural and natural landscapes representing about 230 species from 57 plant families. Despite the small size of the country, existence of 46 agro-ecological regions based on variations in altitude, rainfall and soil, and continuation of traditional farming systems over hundreds of years, with farmers managing production systems to best suit their local conditions, it is not surprising that the country supports a wide range of landraces, traditional and newly improved varieties, though the genetic variation of fruit tree species is little known. The present extent of fruit cultivation in Sri Lanka is about 110,000 ha with an annual production of 640,000 mt. Despite high species diversity of fruit crops, current fruit production is heavily depend on a few species. The major fruits grown are Banana, Pineapple, Papaya, Mango, Avocado and Rambutan but production comes mainly from smallholders and homegardens. Although, it is generally stated that the standard of living of the people can be judged by per capita production and consumption of fruits, present per capita fruit consumption in Sri Lanka is one of the lowest in Asia. Moreover, Sri Lanka spends a considerable amount of foreign exchange to import Apple, Oranges, Grapes, Pears and Peaches. The country is conducting community awareness programmes on nutritive, therapeutic and medicinal values of fruits to improve the level of consumption and thereby increase the demand within the local markets. Training and awareness programmes to disseminate technology and knowledge on consumption, cultivation, postharvest management and processing are also being conducted for these crops. However, the major constraints in fruit cultivation are the lack of appropriate varieties and their quality planting material, standard cultural practices, postharvest processing, value addition and marketing facilities. Therefore, the cultivation of fruits should be encouraged and supported by supplying high quality planting material of desirable varieties, coupled with effective advisory and marketing services. The improved varieties either have to be selected from among the existing populations or introduced from other countries as the south and southeast Asian region share the much of the diversity of many fruit tree species.

Although many fruits have a wide range of domestic and industrial uses, many of them are currently neglected in Sri Lanka and their uses are not properly exploited. In Sri Lanka, germplasm have been collected from several species and from various geographical locations and morphological characters have been recorded using respective descriptor lists. Analysis of such experiments revealed that statistically significant variability has been observed for many important fruit characteristics, such as weight and flesh thickness, seed:flesh ratio, brix value, etc., but largely limited to morphological characterization only. The chemical constituents of fruits are usually obtained from literature based on very old information and chemical characterization of fruits is limited only to a few species and a few chemicals such as antioxidant but again only for a few species with limited sample sizes. Processed products have not been properly characterized based on original material or fresh fruits. Molecular characterization is also limited to a few species. In this context, collection, morphological, chemical and molecular characterization of Sri Lankan fruits are discussed with examples from *Phyllanthus emblica* (Amla/Nelli), *Artocarpus heterophyllus* (Jackfruit), *Aegle marmelos* (Baelfruit), *Tamarindus indica* (Tamarind), *Annona muricata* (Soursop). Research gaps for the country as whole are identified with respect to chemical characterization of fresh fruits and processed products.

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Quality Assurance Status and Future Perspective in Fresh and Processed Fruits of Bangladesh

M.G.Saha[1] and M.M.Molla[2]

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Bangladesh is an agricultural economy based country, 80% of the population is some or other way engaged in production, processing and distribution of foods. Fruit production, preserve, processing and made into quality assurance (QA) products for fresh and processed fruits are very essential for human consumption. QA is a vital part of a food processing industry. It has a broad jurisdiction concerning quality of product individually or collectively. QA justify the quality of a product by using standard specification, sampling frequency and its specific parameters analysis. Since, QA is based on a deliberate, conscious planning of all safety and quality-related activities, with a continuous monitoring of critical control point (CCPs) and evaluation of all programs and processes related to the production thus it becomes extremely important for economy, development and sustainable growth of quality fresh and processed products. At present, fresh and processed food researchers, entrepreneurs and industries in Bangladesh are facing both external and internal problems like lack of proper infrastructure, suitable technology for processing and distribution, storage and marketing of the quality product at national and international market. Some physical factors i.e. quality of planting materials, soil contains some heavy metals in certain regions, use of contaminated water, use of untreated manure, imbalanced use of fertilizer, indiscriminate use of pesticides, proper harvesting time and method, pre-cooling and cooling technique, proper sorting, grading, washing, packaging etc. and some chemical factors like sugar content (total, reducing and non-reducing), acidity, pH, total soluble solid (TSS) etc. are affecting the quality of fresh fruits. Processed fruit quality is determined by the quality of the raw materials utilized (e.g. cultivar, maturity, cultural practices) and the efficiency and care taken during handling, processing, storage and distribution. Colour, odor, taste, flavor, density, viscosity, observation for visual evidence of spoilage, appearance, sensory attributes, leveling and specifications can play an almost indispensable role to maintain quality and acceptability of the processed products. Quality assurance for fresh and processed fruit is meager at both institutional and national level in Bangladesh. The food processing industries followed the standards of Bangladesh Standard and Testing Institute (BSTI) and ISO 9001 for some products. However, the present status of quality control and standards is weak at both institutional and national level in Bangladesh. As a result, the country cannot export fresh & processed fruits in the upstream markets due to the inability to meet the quality assurance requirements. The country is trying to perform the quality assurance of fresh and processed fruits in both national and upstream market.

Main class of polyphenols and antioxidants in indigenous fruits

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Dr Max Reynes

CIRAD, France

The Anti-oxidants molecules are more and more representing a large interest because they limit the stress oxidant (characterised by a ROS: reactive oxygen species), because oxygen molecules are somewhat unstable and can be transformed in reactive species, according the temperature, pressure, etc.

The presentation is a synthesis of various report presentations done by Dr Rock, Dr Guyot from INRA (France), but also from Dr Vaillant, Merck, Brat from Cirad (France) that establish the relation between antioxidant concentration and main classes of vegetables characterized by their external colour. The basic polyphenol chemistry and the polyphenols classes will be presented briefly: simple polyphenols and polyphenol acids, flavonoids, coumarins and napthaquinones, tannins (main classes), in relation with known “antioxidant capacities”. The other main class of antioxidant is the carotenoids class, and a brief presentation of the studies done by Dr Rodriguez Amaya (Brazil) will give some examples of interests of these molecules.

Finally some recommendations for analysis of these molecules will be presented according to our experience and the bioavailability will be presented briefly and the Orac method as actually a reference method.

Studies on extraction, characterization and antioxidant activity of anthocyanins extracted from plum pomace

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Colour of food stuff is one of the most important characteristics determining its acceptability besides enhancing its delicacy. Anthocyanins are naturally occurring compounds which are hygroscopic in nature and responsible for the red, purple, and blue colours of many fruits, vegetables, cereal grains, and flowers. They provide provitamins, antioxidants and endow many health benefits. Plum is one of the most important fruit crops of Himachal Pradesh, India, which is very rich in anthocyanin. Plum fruit cv. Santa Rosa contains 15^{o}B total soluble solids, 2.04 per cent titratable acidity (as malic acid), 34.20 mg/100 g (fresh fruit weight) total anthocyanins and 5.5 per cent pomace. Among different methods used for the extraction of anthocyanins, pomace with water is found to be the best in respect of anthocyanin content and types of anthocyanins which can be identified by thin layer chromatography. Anthocyanins are adsorbed with amberlite adsorbent XAD-16 for 8 hours and eluted with ethanol. Antioxidant activity of anthocyanins is directly related to their concentration increasing with increase in concentration. Study showed that plum pomace is as an excellent source

of biocolourant which can enhance the colour attributes of the pomace as well as nutritional property of the fruit.

An overview on the quality of some indigenous fruits in North Vietnam

Dr Chu, Ky Son

University of Technology, Hanoi (HUT), Vietnam

ABSTRACT NOT YET RECEIVED

E-learning programme on post harvest technology

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Amity International Centre for Post Harvest Technology & Cold Chain Management (AICPHT&CCM) and The Postharvest Education Foundation (PEF) are now in the process of setting up a model Integrated Postharvest Management Center on the Amity University campus in Noida. In preparation for this new training center's launch in 2013, AICPHT &CCM, PEF and Tamale PolyTechnic in Ghana are offering postharvest technology training via **two new Postharvest E-learning Programs during 2012 for young horticultural professionals.**

- The **South Asia 2012 Postharvest E-Learning Program** is open to qualified applicants from India, Pakistan, Bhutan, Sri Lanka, Nepal and Bangladesh and the
- **Global 2012 Postharvest E-Learning Program** is open to applicants from any country in the developing world.

The programs are being run from Amity e-learning Centre, Amity University Uttar Pradesh, Noida.

Training materials: A folder of training materials has been compiled for each assignment and includes a "Read first - Instructions" file. **Interactive web-based activities: Forums :** eForum - the system to clear your doubts and interact with the faculty. **10 Assignments,** Internet searches for orientation, Reading assigned training materials (online and/or on CD), Fieldwork – data collection, interviews, observations.

Steps to improve the factors affecting losses and bridge the gap in knowledge/skills:

Improve understanding of harvest indices of fruit plant and how maturity is related to quality and shelf life. Improve sorting and grading practices during preparation for market. Remove damaged /decaying foods to enter the supply chain and spread decay to other fruits. Improve quality packages which provide protection during handling, transport and storage. Delays in marketing without proper storage (cool storage for perishables). General lack of education on appropriate postharvest

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handling practices and technologies such as those leading to rough handling, mechanical damage, Improperly handled mixed loads, and food safety dangers. Lack of utilization of sustainable cost effective postharvest practices, leading to high levels of food losses on the farm, and in wholesale and retail markets

Expected Outcome : The knowledge and skills gained from this practically oriented field based training will help to improve the quality of extension work and postharvest training programs for small and marginal horticultural farmers and a variety of food handlers, processors and marketers. Gain access to evolving internet based postharvest resources, information and e-mentoring to support long term professional development and improved job performance.

Low cost storage technology for small scale farmers

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Mechanical refrigeration is the best and proven technology for storage of horticultural commodities, yet conventional refrigeration is economically and practically infeasible for limited resource farmers. To overcome this problem a device "CoolBot" conceptualized by Mr. Ron Khosla was tested under a project " CoolBot and cool chain transport for small scale farmers" funded by **HortCRSP** in collaboration with University of California, Davis. CoolBot turns a conventional room air conditioner into a produce cooler. The air conditioner's thermostat is regulated so that the unit keeps running until the room temperature reaches the CoolBot set point. To prevent icing of the fins, the CoolBot measures the fin temperature and stops the compressor when ice builds up. The room temperature is set as desired for the commodity and is maintained during the storage period. With the help of the CoolBot a highly-insulated room can be transformed into a walk-in cooler, keeping the commodity fresh and temperature controlled. The main objective of the project was to select a low cost and locally available insulation material and to test the efficacy of Air Conditioner CoolBot combination system. The insulation material we selected was 1 ft wide mud wall made of special clay mud. To provide support and stability to the wall 9 inch thick partially baked bricks (no 3) were used on all the four walls and the roof was insulated with 6 inch thermocol. A 21000 BTU Air conditioner was installed and the door of the room was standard cold storage door with 30 mm PUF insulation along with an air lock room. The data was recorded with the help of a pico logger. The total cost of the room in combination with Air conditioner, CoolBot and 8 KVA invertor comers to Rs 2.86 lacs. The preliminary results indicated a temperature level inside the cool room at 4-8^{o}C where as the outside temperature showed a varied fluctuation. The experiments conducted at Amity University in the months of May –June when the outside temperature were 42-45^{0}C showed that the Air conditioner CoolBot combination maintained temperature level below 10^{o}C. The core temperature of the commodities was maintained in the range of 8- 9^{o}C which off sets any losses which can occur because of high outside temperatures. This system helps in increasing the shelf life of the produce, provides storage facility to farmers at low cost and helps in planned marketing be preventing distress sale.

NIRS and Its Applications In Assessment of Fruit and Vegetable Quality

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Abstract:

A rapid, precise and non-destructive near infrared spectroscopy (NIRS) was utilized in determination of fruit and vegetable quality. An integrated research work from G. WOLFANG (CGIAR) and F. DAVRIEUX (CIRAD) on the application of NIRS on difference food items are presented. The total-carotenoids and β–carotene in sweet potato freeze-dried storage root samples; the total-carotenoids, β-cryptoxanthin, β–carotene, zeaxanthin and lutein in maize; total soluble solid (TSS) and lipid contents in freeze-dried kernels of two cultivars of coconuts at different stages of ripeness were NIRS scanned and chemometrics analysed (data pre-processing, calibration and model validation). PLS model applied to interactance data from sweet potato have a goodness-of-fit (R^2=0.95) between predicted and actual total carotenoids while this value for ß-carotene was R^2=0.92. The observation of NIRS calibration on maize had a R^2 on total-carotenoids, ß-carotene, lutein, zeaxanthin were 0.93, 0.72, 0.72 and 0.86, respectively. The spectra of 385 coconuts samples were acquired on a NIR Systems 6500 monochromator at the reflectance wavelengths from 400 to 2500 nm at 2 nm interval. Using this spectral library, a classification algorithm was applied to extract 128 samples representative of the library. The latter were used to construct calibration equations in reference to HPLC laboratory analyses for sugar contents and automatic extraction by organic solvent for lipid contents. NIRS was demonstrated as a suitable tool for assessing the quality of coconuts. The cost of the study was lowered by 70%, whilst the volume of organic solvents was reduced by more than 90%.

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