Fresh Produce

Abbreviation: Fresh Prod.
Print: ISSN 1749-4788

Scope and target readership: *Fresh Produce* only publishes original papers and review articles on research in the areas of postharvest storage, treatment, quality evaluation, packaging, handling and distribution of agronomic (including forage) and horticultural crops. Research results spanning from harvest to consumer will be considered.

Postharvest treatments of fresh product (but not food processing) as affecting the quality of processed product will be included. Interdisciplinary research is encouraged.

Market analyses, consumer trends, novel quarantine measures and legislature pertaining to the handling, marketing or distribution of fresh produce also fall into the scope of this journal.

Editor-in-Chief
Jaime A. Teixeira da Silva, Japan

Technical Editor
Kasumi Shima, Japan

Editorial Board and Advisory Panel

Horticulture, Floriculture and Ornamental Plant Science and Biotechnology (D11)
Chhandak Basu, USA
Emilio Cervantes, Spain
Jer-Chia Chang, Taiwan
Suriyan Cha-um, Thailand
Abdolkarim Chehregani, Iran
Samir C. Debnath, Canada
Hany A. El-Shemy, Egypt
Attila Fehér, Hungary
Manuel Fernandes-Ferreira, Portugal
C. Gopi, India
S. Dutta Gupta, India
Faouzi Haouala, Tunisia
Pranab Hazra, India
Domingo Iglesias, Spain
Sladjana Jevremovic, Serbia
Puthiyaparambil JoseKutty, New Zealand
Maurizio Lambardi, Italy
Xinxian Li, Japan
Moahammad J. Malakouti, Iran
Ezaz A. Mamun, Australia
Ákos Máthé, Hungary
Reda Moghaieb, Egypt
Benkeblia Noureddine, Japan
Suprasanna Penna, India
Edouard Pesquet, France
Pio Colepicolo, Brazil
Aluri Jacob Solomon Raju, India
Moshe Reuveni, Israel
Shyamal K. Roy, Bangladesh
Shigeru Satoh, Japan
Sanjai Saxena, India
M. Mehdi Sharifani, Iran
Dharini Sivakumar, South Africa
S. Sudhakaran, India
Judith Thomas, USA
Lining Tian, Canada
Kin-Ying To, Taiwan
Daniel Valero, Spain
Teferi Yeshitela, South Africa
Adnan Younis, Pakistan
Hao Yu, Singapore

Food Science (D7)
Kingsley Anukam, Canada
Maira Bes-Rastrollo, USA
Hany A. El-Shemy, Egypt
P. Ramesh Kumar, India
Xinxian Li, Japan
Sean Liu, USA
Silvia Valtueña Martínez, Italy
Gerald Münch, Australia
Benkeblia Noureddine, Japan
Philippa C. Ojimelukwe, Nigeria
P. Ponmurugan, India
Gamal Hassan Rabie, Egypt
Klára Szentmihályi, Hungary
Daniel Valero, Spain
Lina Yonekura, Japan

Global Science Books, Ltd.
46 Syon Lane, Isleworth, Middlesex
TW7 5NQ, United Kingdom

Editorial Office: Takamatsu, Japan
Accounting: Lagos, Portugal

GSB homepage: www.globalsciencebooks.com
Journal page: http://gsbjournals.client.jp/FP.html
GSB Japan: http://www17.plala.or.jp/gsbjapan
GSB™ is a trademark of Global Science Books, Ltd.

Fresh Produce ©2007 Global Science Books, Ltd.
All rights reserved. No parts of this journal may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, microfilming, recording, or otherwise without written permission from Global Science Books, Ltd.

For additional copies, photocopies, bulk orders, or copyright permissions, please refer requests in writing to the above address, or apply online.

OUR SPONSOR

NK system
Bio & Clean Scientific Instruments
NIPPON MEDICAL & CHEMICAL INSTRUMENTS CO.,LTD.
JQA QM7825

Cover photos: Left: High carbon dioxide enhances the browning due to chilling injury (3°C) in eggplants. Right: Senescent banana (top) treated only with ethylene and senescent banana treated with 1-MCP after the ethylene treatment (bottom). More details in Massantini and Mencarelli, pp 94-100).

Disclaimers: All comments, conclusions, opinions, and recommendations are those of the author(s), and do not necessarily reflect the views of the publisher, or the Editor(s). GSB does not specifically endorse any product mentioned in any manuscript, and accepts product descriptions and details to be an integral part of the scientific content.

Printed in Japan on acid-free paper.

CONTENTS

ABSTRACT

Invited Review: Development of minimal processing (MP) and storage protocols for pre-cut fruits and vegetables is an emerging area with immense commercial potential. The advantages include convenience for various end uses and reduction in packaging as well as transportation costs. The pre- and postharvest considerations stress on various aspects i.e. selection of appropriate varieties with necessary sensory and physiological stability with emphasis on texture, color and the inbuilt resistance against browning and microbial attacks. Pre-cut fresh produce as such is highly vulnerable in terms of physiological and microbiological stability due to the elimination of thermal process to inactivate deteriorative enzymes and latent infections. A minimal process is essential for the removal of field heat by pre-chilling techniques of the pre-cut produce and necessary surface sanitation needs to be carried out to ensure microbial stability during storage. The physiological and microbiological stability can be imparted by the application of anti-respiratory, anti-browning and anti-microbial agents. MP is a “process strategy” to maximize the beneficial effects obtained through synergistic affects of pre-chilling, surface sanitation through non-thermal means, additives and modified atmosphere storage conditions. All the specific attributes described have a pronounced effect on the stabilization of the pre-cut produce. In addition to the pre-conditioning by physico-chemical methods, a modified atmosphere contributes to restrict degenerative physiological changes and microbial profiles in pre-cut produce. MP as a pre-conditioning measure helps to maximize the beneficial effects of low O_2 and high CO_2 atmospheres with humidity regulation within the packages/containers. The process and storage of the pre-cut produce need to address statutory specifications besides ensuring food safety.

ABSTRACT

Invited Mini-Review: Browning is the result of appearance of dark colored pigments formed by enzymatic and non enzymatic reactions. In this review AA, first overview the biochemistry of browning and fruits response and protection, successively touch the topic in the lightly processed fruits. Non enzymatic reaction is mainly due to Maillard reaction compounds in which concentration of amino acid (nitrogen supply) and sugars content plays the important role. Enzymatic reaction is driven mainly by polyphenols oxidase (PPO) but PPO is not the only factor, indeed the decline in the concentration of some browning activators, such as fatty acids and organic acids, and a decrease in phenolic substrate synthesis with increasing ripening, could be even important. Other enzymes are involved in the browning process, more or less intensively, depending on the product. The action of PPO as well as the other enzymes is favoured by membrane degradation which permits the contact between the enzymes and the substrate (PPO and phenols). Thus, every factor affecting membrane layers stability will result in a browning symptom. In some cases, anoxic conditions for short time prevent the appearance of browning because of reduction energy available, or because of the formation of ethanol and acetaldehyde. Carbon dioxide can inhibit browning but it can accelerate. 1-methylcyclopropene, ethylene action inhibitor, can inhibit superficial scald in apple but even provokes browning (greyish peel) in banana. In conclusion there is no prevention action against browning which can be recommended totally safe because the system is very complex and affected from many factors.

ABSTRACT

Invited Review: Plant cell wall metabolism has been suggested to play a major role in the textural changes associated with fruit ripening. The significance of cell wall degrading agents such as polygalacturonase (PG), pectin methylesterase (PME), β-galactosidase (β-gal), endo-1,4-β-glucanase (EGase) and pectate lyase (PL) has led to important advances in our understanding of cell wall disassembly but studies looking at the way these agents may interact and work in concert as ‘a cell wall disassembly line’ will increase our understanding of fruit softening. In addition, the *in vivo* contribution of other cell wall degrading agents such as α-arabinofuranosidase (α-ara), rhamnogalacturonase (RGase), acetylesterase (AE) and xyloglucan transglycosylase hydrolase (XTH) to fruit softening remains to be evaluated. The role of the cell walls in the resistance against pathogens is another area of great interest from a postharvest perspective. Cell wall modifications that could reduce fruit susceptibility to decay would be of great value because of the potential to reduce pathological problems occurring during storage, handling and distribution. Interestingly it has been recently shown in *Arabidopsis* that the over-expression of a plant pectin methylesterase inhibitor can restrict fungal infection. It would be interesting to test whether or not this approach might be useful to control fruit postharvest diseases. Another aspect to explore further includes the determination of the potential applications of proteins influencing the ability of pathogen glycosidases to cleave plant cell wall polysaccharides such as polygalaturonases, pectin or pectate lyases and xyloglucanase inhibiting proteins. The present work describes some of the genetic determinants of the textural modifications in horticultural commodities and discusses the role of plant cell wall polysaccharides and defense proteins as barriers against postharvest pathogens.

ABSTRACT

Invited Mini-Review: Considerable amounts of fruits and vegetables are lost to spoilage after harvest. This loss can range from

10-50% depending on the commodity and country. Presently, synthetic chemicals are the primary means of controlling post harvest diseases of fruits and vegetables. Public concern over food safety, however, enunciated interest to find out the effective alternatives to chemical pesticides to control post harvest diseases of perishables. The ultimate aim of recent research in this area has been the development and evaluation of various alternative control strategies to reduce dependency on synthetic fungicides. Currently several promising biological approaches that include the application of microbial antagonists (fungi, bacteria, yeasts), the natural plant based antimicrobial substances (volatile aromatic compounds, acetic acid, jasmonates, glucosinolates, essential oils, plant extracts and propolis), the antimicrobial substances from soil (fusapyrone and deoxyfusapyrone) and the natural animal-based antimicrobial substances like chitosan have been advanced to curb the menaces of post harvest diseases in perishables. Compounds that activate host plant defense responses potentially offer socio-environmentally sound alternative methods for disease control. Combination of the above complementary techniques could well lead to effective control of post harvest diseases. The techniques and practice of using all these non-conventional alternatives is still in its infancy as compared to chemical treatments but the results and progress in this area during the past decade has been remarkable.

ABSTRACT

Invited Review: Forage quality refers to how well animals consume a forage and how efficiently the nutrients in the forage are converted into animal products. Six major factors affecting forage quality: maturity (harvest date), crop species (differences between grasses and legumes), techniques of harvest and storage, environment (moisture, temperature and amount of sunlight), soil fertility, variety or cultivar. Also, weeds, insect pests, plant diseases and presence of bacteria, molds, and/or some of their metabolites, e.g. mycotoxins can negatively affect forage quality. Recommended tests for determining forage quality are: dry matter (DM), pH, crude protein (CP), available protein, amoniacal nitrogen (as % NH_3/NT), acid detergent fiber (ADF), neutral detergent fiber (NDF), lignin and ash. Energy values such as total digestible nutrients (TDN), net energy (NE) and relative feed values (RFV) can be calculated from these core analyses. There are two methods used to analyse such variables: the traditional chemistry analysis and the newer, near infrared reflectance spectroscopy (NIRS) analysis. Currently, the quality of a forage has been evaluated only through those chemico-fermentative parameters. However, recent studies propose to incorporate the analysis of microbiological variables parameters such as fungal propagule counts, the presence of *Aspergillus fumigatus* and mycotoxins (aflatoxins and deoxynivalenol) as decisive parameters of forage acceptability. Forage quality information is important for formulating nutritionally balanced rations, evaluating forage management practices (growing conditions, timing of harvest, and handling from harvesting to utilization) and marketing and pricing forages.

ABSTRACT

Invited Review: Guava, *Psidium guajava* L. (Myrtaceae), which has a unique quince and banana–like odor, is native to Central America. It is frequently cultivated as a food for its pleasant fruit that is also used in juice processing. Today, the trees can be found cultivated or growing wild in nearly the entire Mesoamerican geographical area, all the countries of the Tropical World Belt, from the West Coast of Africa to the Pacific Region, including India, China and Taiwan. Guava is a great fruit because it contains key nutrients like vitamin C, vitamin B group potassium, fiber, calcium and iron. Vitamin C content in guava is second only to acerola (*Malpighia glabra* L.). In guava, the level of total sugar and its major components, glucose and sucrose, increase during growth and development of intact fruits. Guava is popular to consumers because of its aroma. More than 500 volatile compounds have already been found in the guava. Volatile compounds change in guava fruits at different stages of maturity during ripening. Guava leaves also have been used to treat many ailments, including cough and pulmonary disease in Bolivia and Egypt. In Mexico, guava leaves are extensively used to stop diarrhea and for the alleviation of gastrointestinal disorder, a common practice originally inherited from traditional Aztec medicine. In Taiwan, it is also known that leaves and fruit can improve the glucose level in patients with type 2 diabetes.

ABSTRACT

Invited Review: Banana (*Musa* sp.) is one of the most economically important fruit crops in the world. The banana fruit is generally harvested and stored in a mature green state. Fruit ripening involves a transient burst in ethylene production that coordinates ripening-associated process. These processes include the respiratory climacteric, pulp softening, peel de-greening, and production of aroma compounds. Avoidance of exposure to ethylene and control of endogenous ethylene synthesis are key measures for banana storage. Other important factors that influence banana fruit storage life are pathogen development, mechanical damage, and variable maturity. The interaction of these factors can lead to uneven and unpredictable ripening that has adverse implications for marketability. Low temperature storage is highly effective in reducing decay and extending the storage life of harvested banana. However, banana fruit are chilling sensitive and storage at sub-optimal temperatures results in injury symptoms that include peel discoloration and abnormal ripening. These symptoms are common when banana fruit are stored at temperatures below about 13°C. Controlled atmosphere (CA) storage or modified atmosphere (MA) packaging constitute adjunct or alternative technologies to extend the green life of harvested fruit. These technologies can be effective at ambient temperatures, particularly in combination with the use of ethylene absorbing compounds and / or treatments that prevent ethylene action or inhibit rots. However, if CO_2 concentrations become too high, the fruit may fail to ripen normally. The relatively recently introduced ethylene binding site blocker, 1-methylcyclopropene (1-MCP), can effectively inhibit ethylene

action on banana fruit. Applied as a gas, like ethylene, 1-MCP has demonstrated potential for the modulation of ripening and senescence processes in banana fruit. Overall, postharvest research on banana fruit remains focused on control of ethylene synthesis and action and on suppression of disease development, including by chemical-free means.