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Cold chain management of vegetables

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Foreword

The Working Group on Cold Chain Management of Vegetables prepared this Technical Reference (TR) under the purview of the Food Standards Committee. This work is done in response to the request for such a TR by the industry.

Various sectors of the cold chain (growers, importers, logistics providers and retailers) participated in the development of this TR. The organisations involved include Agri-Food & Veterinary Authority (AVA), Consumers Association of Singapore, Fruits and Vegetables Association of Singapore, National Environment Agency, Singapore Airport Terminal Services (SATS), Singapore Cold Chain Centre/Efficient Consumer Response Council (ECR) Singapore and SPRING Singapore.

The TR is developed to meet the increasing demand by consumers for value-for-money agri-produce, in terms of safety, freshness, quality and availability over a sustained manner. It aims to establish a benchmark for cold chain management of vegetables, in particular leafy vegetables, headed vegetables, fruited vegetables, and herbs. The TR covers the major five links of cold chain management of vegetables starting from farm, packing house, transportation, retail, and finally, to the consumers. Proper management of every link of the Cold chain is critical as each link constitutes an integral part of the Chain, and a break in any link would compromise the integrity of the Chain and hence the safety and quality of the produce concerned.

It is hoped that the TR will benefit participants of the cold chain management of vegetables, and in the process, ensure its widespread applicability by the industry thereby benefiting consumers in the long run.

This TR is recommended to be used by growers, importers, logistics providers, retailers and seaport/airport ground handling parties.

This TR is not to be regarded as a Singapore Standard. This TR is made available for provisional application over a period of two years, but does not have the status of a Singapore Standard. The aim is to use the experience gained during the two years of the implementation of the TR to review and to modify the TR so that it can be upgraded as a Singapore Standard. Users of the TR are invited to comment on its technical content, ease of use and any ambiguities or anomalies. These comments can be submitted using the feedback form provided at the end of the TR and will be taken into account in the review of the publication in two years' time. At the end of the two years, the TR will be reviewed by the WG to discuss the comments received and to determine its suitability as a Singapore Standard. Submission for approval by the Standards Council as a Singapore Standard will be carried out only upon agreement after review by the Working Group.

In preparing this Technical Reference, reference was made to the following publications:

1. Gustavo V. Barbosa-Cánovas, et al, 2003, Handling and Preservation of Fruits and Vegetables by Combined Methods for Rural Areas, FAO Agricultural Services Bulletin 149, Chapter 2 in "Basic harvest and post-harvest handling considerations for fresh fruits and vegetables". http://www.fao.org/docrep/005/Y4358E/y4358e05.htm

2. SARDI, 2005. Maintaining The Cold Chain. South Australian Research and Development Institute (SARDI), Victorian Airfreight Council, Victorian Sea Freight Industry Council (VSFIC)

3. Korea Food Research Institute, 2001, Postharvest Technology of Fresh Produce for ASEAN Countries

4. HPB, 2004. All about Fruit and Vegetables Health Promotion Board (HPB), E350-02/R04

5. Agri-Food & Veterinary Authority of Singapore, 2005. Hand Book on Certification on Good Agricultural Practice for Vegetable Farming (GAP-VF), Version 2

6. Adel A. Kader and Rosa S. Rolle, 2004. The role of post-harvest management in assuring the quality and safety of horticultural produce, FAO Agricultural Services Bulletin 152 Publisher: Rome: Food and Agriculture Organization of the United Nations

7. Byeong-Sam Kim, Korea Food Research Institute, 2001. Temperature Control: Precooling and Curing, (unpublished information)

8. International Air Transport Association, 2005.IATA Perishable Cargo Handling Manual, 5th edition

9. Janet Bachmann and Richard Earles, 2000. Appropriate Technology Transfer for Rural Areas (ATTRA), Postharvest Handling of Fruits and Vegetables, http;//www.attra.org/attra-pub/postharvest.html

10. Jenny Jobling, Sydney Postharvest Laboratory, 2000. Correct Cool Chain Management is Essential for all Fruit and Vegetables, www.postharvest.com.au/Information_Sheets.htm

11. Jenny Jobling, Sydney Postharvest Laboratory, 2000. Practical Solutions for Temperature Management, www.postharvest.com.au/Temperature_article3.PDF

12. Jenny Jobling, Sydney Postharvest Laboratory, 2000. The Mechanics of Refrigeration. www.postharvest.com.au/Temperature_article2.PDF

13. Jenny Jobling, Sydney Postharvest Laboratory, 2002. Postharvest Management of Fruits and Vegetables, www.postharvest.com.au/Postharvest.PDF

14. Seung-Koo Lee, Seoul National University, 2001. Overview of Post-harvest Technology for Perishable Crops, (unpublished information)

Acknowledgement is made for the use of information from the above publications.

Technical Reference for cold chain management of vegetables

0 Introduction

Singapore imports more than 90% of its vegetable supply. In order to ensure a resilient supply of quality, safe and wholesome vegetables for consumers, the industry together with SPRING Singapore and the Agri-Food & Veterinary Authority of Singapore (AVA) collaborated to develop a Technical Reference (TR) for Cold Chain Management of Vegetables. This TR covers whole leafy, headed, fruited vegetables and herbs.

The maintenance of the cold chain for vegetables is important for maintaining the freshness, shelf life, quality (including nutritional value and sensory characteristics) and safety of perishable vegetables. The cold chain helps to extend the shelf life of vegetables by slowing down the deterioration process caused by exposure to higher temperatures, accumulation of ethylene and microbial spoilage. The maintenance of the cold chain for vegetables is more complex than for other products as harvested vegetables are still living and respiring. Therefore both temperature and humidity affect the freshness and quality of vegetables as explained in Annex A. It is important to measure and record the surface temperature of the vegetables at each link of the cold chain. This TR is not exhaustive and is useful as a reference for the general principles of cold chain management of vegetables, as cold chain is an important element of quality assurance system of vegetables.

Modern technologies for vegetables production at the farm, pre-harvest considerations, post-harvest handling techniques, packaging, storage, distribution and transportation modes constitute integral parts of the vegetable cold chain management process. All of these processes have a significant impact on the quality as well as shelf life of vegetables. Only proper management at every stage of this cold chain would enable the supply of fresh, quality, wholesome and safe vegetables to consumers.

Many significant advantages can be derived by the business partners and consumers in various stages through the adoption and implementation of this TR. This TR will help clarify uncertainty and misconception concerning the handling, quality, wholesomeness and safety of vegetables. Proper management of the cold chain will ensure that nutritional and sensory qualities of vegetables are preserved while wastage arising from microbial spoilage, physiological breakdown and physical injuries to vegetables throughout the supply chain are greatly reduced, thus resulting in preserving the freshness, quality and also the higher value which the vegetables can command in the market. Through proper management of the cold chain, there will be an increase in productivity to all parties along the value chain.

It must be emphasised that apart from temperature and humidity control, all premises in the supply chain, including farm vegetables collection areas, pre-cooling facilities, packing area, ante-rooms, chiller rooms and retailing areas must be cleaned thoroughly to avoid microbial contamination from soil and decayed vegetables.

1 Objectives

The objectives of this TR are to establish a quality assurance system and provide benchmarks for the management of temperature and relative humidity profiles in the stages of cold chain for vegetables. It aims to establish and implement best practices in cold chain management of vegetables for adoption by the industry especially for import / export, local production, distribution and retail of vegetables. It also aims to ensure the safety, quality and wholesomeness of vegetables, safeguard public health and reduce unnecessary wastage. The TR aims to develop an integrated cold chain management network from farm to fork.