

SINGAPORE STANDARD

Cold chain management of vegetables



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Foreword

This Singapore Standard was prepared by the Working Group on Cold Chain Management of Vegetables under the direction of the Food Standards Committee.

The standard 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 standard covers the major links of cold chain management of vegetables starting from farm, packing house, transportation, distribution and wholesale centre to retail. Proper management of every link of the cold chain is critical as each link constitutes an integral part of the chain. A break in any link will compromise the integrity of the chain and hence the safety and quality of the produce concerned.

It is hoped that the standard 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 standard is recommended to be used by growers, importers, logistics providers, retailers and seaport/airport ground handling parties.

Reference was made to the following publications for the Technical Reference, TR 24 : 2007, from which this Singapore Standard was derived:

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. Health Promotion Board (HPB), E350-02/R04. All about Fruit and Vegetables, 2004
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. International Air Transport Association, 2005. IATA Perishable Cargo Handling Manual, 5th edition
8. Janet Bachmann and Richard Earles, 2000. Appropriate Technology Transfer for Rural Areas (ATTRA), Postharvest Handling of Fruits and Vegetables, <http://www.attra.org/atrapub/postharvest.html>
9. Jenny Jobling, Sydney Postharvest Laboratory, 2000. Correct Cool Chain Management is Essential for all Fruit and Vegetables, www.postharvest.com.au/Information_Sheets.htm
10. Jenny Jobling, Sydney Postharvest Laboratory, 2000. Practical Solutions for Temperature Management, www.postharvest.com.au/Temperature_article3.PDF

11. Jenny Jobling, Sydney Postharvest Laboratory, 2000. The Mechanics of Refrigeration. www.postharvest.com.au/Temperature_article2.PDF
12. Jenny Jobling, Sydney Postharvest Laboratory, 2002. Postharvest Management of Fruits and Vegetables, www.postharvest.com.au/Postharvest.PDF

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

Attention is drawn to the possibility that some of the elements of this Singapore Standard may be the subject of patent rights. Enterprise Singapore shall not be held responsible for identifying any or all of such patent rights.

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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 Singapore Standard (SS) for cold chain management of vegetables. This SS 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 food 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 relative 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 SS 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 the 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 SS. This SS 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 is greatly reduced, thus resulting in fresher and higher quality vegetables which can command a higher value 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 should be emphasised that apart from temperature and relative humidity control, all premises in the supply chain, including farm, pre-cooling facilities, packing area, ante-rooms, cold rooms and retailing areas shall be thoroughly cleaned to avoid microbial contamination from soil and decayed vegetables.

1 Scope and objectives

1.1 Scope

The SS covers the proper cold chain management of vegetables from the pre-harvest and harvesting practices at the farm, to post-harvest handling, packing / packaging, storage, transportation, distribution, and retail sale so as to ensure food safety, freshness and quality. This SS is applicable to whole, intact vegetables which are not further processed. It covers whole leafy, headed, fruited vegetables, and herbs.

1.2 Objectives

The objectives of this SS 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.
- establish and implement best practices in cold chain management of vegetables for adoption by the industry, especially for import / export, local production, packing, distribution and retailing of vegetables.
- ensure the food safety, quality and wholesomeness of vegetables, safeguard public health and reduce unnecessary wastage.
- develop an integrated cold chain management network from farm to fork.

2 Normative references

There is no normative reference applied in this standard.