SRI LANKA STANDARD 1040 : PART 2 : 1996

UDC 634.773:631.55/.56:621.798

CODE OF PRACTICE FOR HARVESTING AND HANDLING OF FRESH FRUITS AND VEGETABLES

PART 2 : 'EMBUL' BANANAS FOR EXPORT

SRI LANKA STANDARDS INSTITUTION

CODE OF PRACTICE FOR HARVESTING AND HANDLING OF FRESH FRUITS AND VEGETABLES
PART 2 : 'EMBUL' BANANAS FOR EXPORT

SLS 1040: Part 2:1996

Gr. 6

SRI LANKA STANDARDS INSTITUTION
53, Dharmapala Mawatha,
Colombo 03
Sri Lanka.

Sri Lanka Standards are subject to periodical revision in order to accommodate the progress made by industry. Suggestions for improvement will be recorded and brought to the notice of the Committees to which the revisions are entrusted.

This standard does not purport to include all the necessary provisions of a contract.

Sri Lanka Standard
CODE OF PRACTICE FOR HARVESTING AND HANDLING OF FRESH FRUITS AND VEGETABLES
Part 2 : 'Embul' bananas for export

FOREWORD

This standard was approved by the Sectoral Committee on Agriculture and Food Technology - 1 and was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on 1996-10-17.

'Embul' variety bananas have a high export potential besides their large consumption within the country. Bananas are required to be transported to long distances and for varying lengths of time. In order to ensure that bananas reach the consumer's end in a proper condition, it is necessary that they are maintained under certain conditions so as to prolong their storage in an unripe condition. It is necessary that the bananas are harvested at a certain stage of maturity, are healthy, and are also handled properly during different phases of transport and storage. The objective of formulating this code of practice is to assist those involved in the export of bananas.

During the formulation of this specification due consideration has been given to the relevant provisions made under the Sri Lanka Food Act No. 26 to 1980. Specific requirements given in the specification, wherever applicable are in accordance with relevant regulations. However, general provisions made under the Sri Lanka Food Act have not been included in this specification and therefore, the attention of the user of this specification is drawn to these general provisions.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or an analysis, shall be rounded off in accordance with **CS 102**. The number of significant places retained in the rounded off value shall be the same as that of the specified value in this standard.

In the preparation of this standard the assistance derived from the following publications is gratefully acknowledged:

i) ISO 931 : 1980 International standard for green bananas - Guide to storage and transport.
ii) IS 6028 : 1983 Indian Standard guide for storage and transport of green bananas.
iii) HURLSTON, E.F, Sri Lanka bananas production and post harvest technology manual, prepared for Mahaweli Authority of Sri Lanka, Colombo.

1 SCOPE

This standard recommends a code of practice to be adopted in harvesting, handling, packaging, marking, storage and transportation of 'Embul' type bananas for export.

2 REFERENCES

SLS 910 Limits for pesticide residues in food

3 DEFINITIONS

For the purpose of this standard the following definitions shall apply:

3.1 mature green : The stage at which the fruits are mature but ripening has not been initiated and at which the peel colour is still green.

3.2 finger : The individual bananas which make up a "hand" on a stem of bananas.

3.3 hand : The double row of fruits initially covered by a bract when the stem is in its inflorescence stage.

3.4 bunch : Hands of fruits attached to the stem.

3.5 preliminary cooling : The removal of field heat from the product prior to storage at optimal low temperature to extend storage life.

3.6 air-circulation ratio : The ratio of volume of air passed in one hour by the fans, to the volume in the empty chamber.

3.7 rate of air-change : The ratio of the volume of outside air introduced into the cold store in one hour, to the volume of empty closure.

4 CONDITIONS FOR HARVESTING AND STORAGE

4.1 Selection of bananas

The fruits intended for export should be mature green, whole, free from rubbing, bruising, sunburns or any other defects.

4.1.1 *Criteria for maturity*

Maturity of the fruits at the time of selection is an important factor as it indicates how long the fruits can remain in green and unripe condition, when stored at low temperature after harvest. For determining the degree of maturity the following criteria can be used:

a) Fullness, which is a dimensional characteristic; and
b) A period of 11 weeks to 12 weeks after the first fingers of the second hand appear on the bunch.

4.1.2 *Judgement of degree of maturity*

The stages of maturity of the banana are determined quickly in the field by the following:

a) Visual means;
b) Tagging the banana with coloured ribbons immediately after the emergence of the second hand and counting the weeks thereafter;
c) Mass/length ratio;
d) Pulp/peel ratio; or
e) Colour of the pulp.

For ascertaining the degree of maturity of the bunch of banana, representative fruits found in the bunch which is in the most advanced state of ripeness, namely the second hand should be examined. The centre fruit of normal shape in the inside row of the second hand should be considered as the representative fruit.

4.2 Harvesting

During harvesting care should be exercised to avoid bruising of fruits. The selected banana bunches should be cut with a single stroke, 200 mm to 250 mm above the first hand. The bunch should be placed carefully on 100-mm to 120-mm thick bed of banana leaves on the ground, to allow the latex to flow from the cut ends away from the bunch.

A single bunch should be carried to the pack house on shoulder covered with thick padding material to avoid injury to the fruits. Bunches may be transferred hung on wooden poles which are carried on shoulders. Bunches may also be carried to the pack house in a padded tractor.

Care should be taken to avoid exposure to direct sunlight after harvest wherever possible. The banana bunches should never come into contact with the soil at any time during the operation.

4.3 Quality characteristics

The bananas should be free from signs of attack by fungi, bacteria, insects or any other pests, and should be free from parasites. They should not be injured, and should be free of physiological diseases.

4.3.1 Removal of the dried floral remnants should be carried out in areas where the climate and conditions of cultivation favours the development of rot. It should be carried out on the tree itself if the size of the banana tree allows so.

4.3.2 In order to avoid development of fungal diseases during storage, the fruit should be clean. It should not be stained with sap. The fruit stalks should be intact. The main stalks of the bunches should not show marks of sunburns and its two sections should be fresh, clean and without smears or breaks.

4.3.3 The banana should be free from evident marks of rubbing, scraping, bruising or sunburn, particularly when catering to quality conscious markets.

5 HANDLING

5.1 Dehanding may be facilitated by hanging the curve end of the stem of the bunch on a horizontal bar. A sharp curve knife may be used for dehanding. Bunches should be dehanded, leaving about 25-mm to 40-mm stem portion attached to the hand, without inflicting knife wounds on the fruits of the lower or the same hand. A second person should receive the hands from the cutter and place it with care on the midrib of a banana leave so as to drain the latex from the cut end.

5.2 The hands should be placed in a tank containing a one per cent solution of alum for 15 minutes to 20 minutes. Hands should then be placed on a mat spread on the ground for drying.

5.3 The bananas should not contain fungicide residue in excess of the limit prescribed in **SLS 910**.

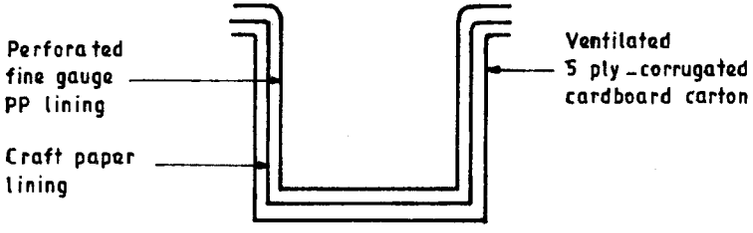
5.4 Preliminary cooling systems may be used to remove field heat of bananas quickly and efficiently, particularly with reference to sea shipment.

6 PACKAGING

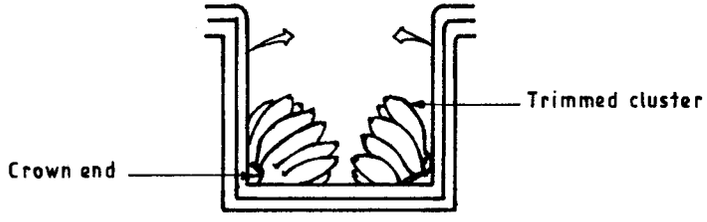
6.1 The bananas should be packed in cartons of telescopic type made of corrugated fibreboard box having ventilation apertures.

6.2 It is recommended that the box used for the packing of banana should contain a kraft paper sheet. The kraft paper should be centered on the bottom of the box. A clear perforated slip sheet (thin polyethylene plastic sheet) having holes of approximately 12 mm should be folded over the kraft paper so that the bottom of the box is covered by both the kraft paper and the slip sheet, and the slip sheet overhangs both sides of the box.

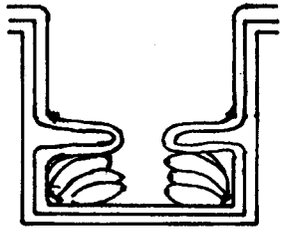
The banana hands should be placed in the center of the box with the crown facing away from the centre. The slip sheet should be pulled over the first row and snaked back to rest over the side of the box. A second row of hands are placed over the slip sheet on top of the first row with the crown facing the centre. The other end of the slip sheet is snaked over the second row and the kraft paper is doubled over the bottom two rows for additional protection against crown damage to the bottom rows. The box should then be closed (see Fig. 1).



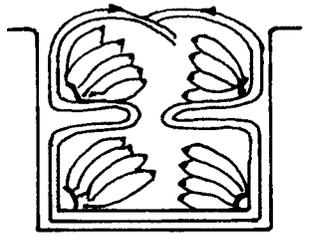
Stage 1 : Lining of cartons



Stage 2 : Placement of clusters in carton



Stage 3 : Folding in of both liners over the first layer



Stage 4 : Placement of second layer of bananas

FIGURE 1 – Box arrangements for packing of bananas

6.3 Ventilation apertures should not be covered by sealing tape during packing.

6.4 Alignment of ventilation apertures should be ensured when cartons are stacked for storage and transportation.

6.5 Every precaution should be taken:

i. to prevent direct sunlight falling on the box;
ii. to avoid parking the vehicle carrying the banana in the sun; and
iii. to avoid excessive handling.

7 MARKING

7.1 The cartons should be legibly and indelibly marked or labelled with the following:

a) Name of the product;
b) Net mass, in kilograms; and
c) Name and address of the exporter.

7.2 In order to facilitate careful handling of bananas the following markings are recommended:

a) The words "Fresh Speciality Banana";
b) Pictorial marking for "this way up" (see Fig. 2);
c) Pictorial marking for "fragile" contents (see Fig. 3); and
d) Pictorial marking for temperature limits (see Fig. 4) in the case of packages transported by sea.

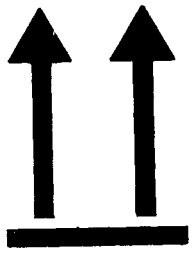


FIGURE 2 - Pictorial marking for "this way up"

FIGURE 3 - Pictorial marking for "fragile" contents

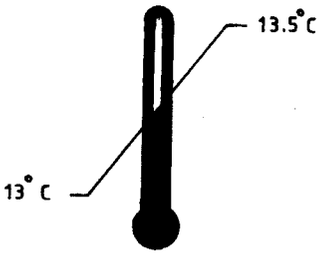


FIGURE 4 - Pictorial marking for temperature limits

8 STORAGE

8.1 Temperature

The temperature of the banana at the time of loading into the ship hold should be lowered to 13.5 ^{0}C. The temperature of the delivery air during storage should be maintained between 13 ^{0}C and 13.5 ^{0}C throughout the journey.

8.2 Relative humidity

The relative humidity in the cold storage chamber should be maintained between 85 per cent and 90 per cent.

8.3 Air-circulation ratio

The air-circulation ratio should be 80 per cent to 100 per cent during cooling. It may be reduced by half during transport after the end of cooling.

8.4 Rate of air-change

The rate of air-change should be one air change per hour. The rate may be reduced by half during the cooling period.

8.5 Ripening

8.5.1 Ripening of bananas during storage should be avoided by all possible means. Ripening is accompanied by an increase in the production of carbon dioxide and ethylene, which is liable to trigger the ripening of the adjacent banana.

8.5.2 Carbon dioxide and ethylene can be removed without any action on the adjacent fruit with an efficient ventilation system, ensuring continuous sweeping of all parts of the load by the air circulating in the holds of the banana vessel and with continuous changes of fresh air.

8.5.3 The occurrence of an abnormal percentage of ripe bananas on discharge of the banana vessel arises from four causes which should be avoided.

i. Keeping at ambient temperature at the port of arrival;
ii. Loading of banana at too advanced a stage of ripeness;
iii. Defects in ventilation; and
iv. Defects in the refrigeration plant.

9 TRANSPORT

9.1 Packages for export should be transported preferably in the late evening in a sheltered vehicle and kept indoors before despatch.

9.2 Products intended for sea shipment should be transported under refrigeration.

SLS CERTIFICATION MARK

The Sri Lanka Standards Institution is the owner of the registered certification mark shown below. Beneath the mark, the number of the Sri Lanka Standard relevant to the product is indicated. This mark may be used only by those who have obtained permits under the SLS certification marks scheme. The presence of this mark on or in relation to a product conveys the assurance that they have been produced to comply with the requirements of the relevant Sri Lanka Standard under a well designed system of quality control inspection and testing operated by the manufacturer and supervised by the SLSI *which includes surveillance inspection of the factory, testing of both factory and market samples.*

Further particulars of the terms and conditions of the permit may be obtained from the Sri *Lanka Standards Institution, 17, Victoria Place, Elvitigala Mawatha, Colombo 08.*

Printed at SLSI (Printing Unit)

SRI LANKA STANDARDS INSTITUTION

The Sri Lanka Standards Institution (SLSI) is the National Standards Organization of Sri Lanka established under the Sri Lanka Standards Institution Act No. 6 of 1984 which repealed and replaced the Bureau of Ceylon Standards Act No. 38 of 1964. The Institution functions under the Ministry of Science & Technology.

The principal objects of the Institution as set out in the Act are to prepare standards and promote their adoption, to provide facilities for examination and testing of products, to operate a Certification Marks Scheme, to certify the quality of products meant for local consumption or exports and to promote standardization and quality control by educational, consultancy and research activity.

The Institution is financed by Government grants, and by the income from the sale of its publications and other services offered for Industry and Business Sector. Financial and administrative control is vested in a Council appointed in accordance with the provisions of the Act.

The development and formulation of National Standards is carried out by Technical Experts and representatives of other interest groups, assisted by the permanent officers of the Institution. These Technical Committees are appointed under the purview of the Sectoral Committees which in turn are appointed by the Council. The Sectoral Committees give the final Technical approval for the Draft National Standards prior to the approval by the Council of the SLSI.

All members of the Technical and Sectoral Committees render their services in an honorary capacity. In this process the Institution endeavours to ensure adequate representation of all view points.

In the International field the Institution represents Sri Lanka in the International Organization for Standardization (ISO), and participates in such fields of standardization as are of special interest to Sri Lanka.

Printed at the Sri Lanka Standards Institution, 17, Victoria Place, Elvitigala Mawatha, Colombo 08.