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On behalf of: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety of the Federal Republic of Germany

Cold Chain Logistics Resource Centre

Confederation of Indian Industry

*Post-Harvest Management Protocols*

# ONION

India is the 2nd largest producer of onion. **Total production for the year 2019-20 was 26148 ('000 MT)** and major onion producing states are Maharashtra, Madhya Pradesh, Karnataka, Bihar, Rajasthan, Andhra Pradesh and Haryana. These states have consistently featured as the top onion producing states in the last three years. They contribute approximately 83.3% of the total onion produced from the country.

## MATURITY INDICES OF ONION

The condition of onion leaves is a good indicator of the maturity and general state of the bulb. Bulb onions which are to be stored should be allowed to mature fully before harvest and this occurs when the leaves bend just above the top of the bulb and fall over. As a practical guide, farmers should conduct sample counts on the number of bulbs, which have fallen over in a field; and when the percentage of bulbs, which have fallen over, reaches about 70-80% then the entire crop should be harvested.

Bulbs generally mature within 100-140 days from sowing, depending on the cultivar and the weather. Spring onions mature for harvesting after 35-45 days from sowing.

## CURING

In India manual harvesting is the most common practice for Onions. Harvested crop should be allowed to dry or cure and ripen in the sun for several days after lifting. Onions can also be cured by tying the tops of the bulbs in bunches and hanging them on a horizontal pole in a well-ventilated shade.

This process helps to dry off the necks and outer scale leaves of the bulbs to prevent the loss of moisture and the attack by decay during storage.Usually 10-15 days is sufficient for curing the Onion bulbs. Onions are considered cured when neck is tight and the outer scales are dried until they rustle. Weight losses of 3-5% are normal under ambient drying conditions and up to 10% with artificial drying.

## GRADING

Sorting and Grading of Onions should be done prior to storage. Soil and other foreign materials must be removed and badly affected produce must be discarded. Cleaning may be carried out using air or by manually removing unwanted materials on the bulb surface. Care should be taken to avoid physical injury onthe bulb.

### Major Onion Varieties cultivated in India are:

- Agrifound Dark Red
- Agrifound Light Red
- NHRDF-Red
- NHRDFRed-2
- NHRDF-Red-3
- NHRDF-Red-4
- Agrifound White
- NHRDF Fursungi

Onion (Small)

- Agrifound Rose

Onion (Multiplier)

- Agrifound Red
- Advance Line – 883
- Advance Line – 863

## PACKING

Good packaging for onions should follow two key principles. Firstly, the packing material should be strong enough to retain the required weight of onions under the conditions of transport and storage. Secondly, the packaging should allow sufficient ventilation for the air around the bulbs to maintain relative humidity in the required range.

Onions can be packaged and stored in a variety of containers such as boxes, cartons, bags, bulk bins, pre-packs, plastic film bags, and stretch-wrapped trays. Packages typically contain 25 kg and above,

especially for transporting crop from field to store and/or during storage. The same 25 kg bags or smaller bags may be used from store to market place. Decision on which type of packaging to use depends on crop size, length of storage and marketing requirements. A problem with packaging onions in boxes, net bags and bulk bins is that if they are too large, and airflow pattern tends to be around rather than through them. Under this condition, the respiration heat of the bulb results in a warm, humid environment in the centre of the package, which can result in decay or sprouting.

In India, usually Onions are packed in jute (hessian) bags for transporting to yard or brought as loose. For safe handling, 40 kg open mesh jute bags having 200-300 g weight should be used in domestic market. Nylon net bags result in less storage loss because of good ventilation. Losses due to rot is reported to be more if onions are stored in gunny bags than in loose or wooden crates.

For export, common big onions are packed in 5-25 kg size open mesh jute bags. Bangalore Rose and multiplier onions are packed for export in 14-15 kg wooden baskets

## STORAGE

The objectives of onion storage are to extend the period of availability of crop, maintain optimum bulb quality and minimise losses from physical, physiological, and pathological agents. Bulbs selected for storage should be firm and the neck dry and thin. Thick necked crops should be discarded as they are most likely to have high moisture content than optimum for storage, and therefore would have short storage life.

Several technology options are available for bulk storage of onions, including low-temperate storage, high- temperature storage, and the use of controlled atmosphere (CA) stores.

Low Temperature Storage: For successful low temperature storage, good ventilation and a low level humidity in the range of 70-75% is essential. To maintain good quality crop, the period of storage varies but may be up to 200 days. For large-scale commercial storage, onions are usually stored under refrigeration and the most commonly recommended conditions are 0°C with 70-75% RH. Regular ventilation and monitoring of both temperature and relative humidity in the store are necessary to avoid significant fluctuations in environmental conditions.

High Temperature Storage:Onions can be stored at high temperatures of over 25°C at a range of relative humidity (75- 85%) which is necessary for minimising water loss. Storage at temperatures of 25-30°C has been shown to reduce sprouting and root growth compared to low-temperature storage (10- 20°C). However, weight loss, desiccation of bulbs, and rots occurred at high temperatures, ONIONS: Post-harvest Operations Page 13 making the system uneconomic for long periods of storage that is required for successful onion marketing.

CA Storage: CA is used in combination with cold storage to extend the storage life of onions. However, commercial CA storage of onion bulbs is limited partly because of variable success and inconsistent effects on bulb quality.

Ventilated Storage:For bulk storage of onions, ventilation systems should be designed to provide air into the store from the bottom of the room at a rate of 2 cubic feet per minute per cubic feet of produce. If produce is in cartons or bins, stacks must allow free movement of air. Rows of containers should be stacked parallel to the direction of the flow of air and be spaced six to seven inches apart. An adequate air supply must be provided at the bottom of each row and containers must be properly vented.

Sprouting in onion is controlled by temperature. The temperature between 10-25°C increases sprouting. Rooting is influenced by relative humidity (RH). More the relative humidity, more is rooting. Weight loss is more when temperature is above 35°C. Under ambient conditions the onions are stored O at a temperature of 30-35°C with RH of 65-70%. In cold storage, temperature is maintained at 0-2°C while the RH is kept at 60-75%.

Recommended Temperature
(degree Celcius)

**0-5**

Recommended Relative
Humidity (%)

**65-75**

Shelf Life

**1 to 8 Month**

| | |
|---|---|
| Product Loading Density (in Pound/cu.ft) | - |
| Initial Freezing Point (in degree celcius) | **-0.8** |
| Specific Heat Above Freezing Point in (kJ/Kg.K) | **3.78** |
| Specific Heat Below Freezing Point (in kJ/Kg.K) | **1.94** |
| Latent Heat of Fusion (in kJ/Kg) | **294** |
| **Thermal properties of Onion** | |
| Initial Freezing Point (in degree celcius) | **-1.1** |
| Specific Heat Above Freezing Point in (kJ/Kg.K) | **3.65** |
| Specific Heat Below Freezing Point (in kJ/Kg.K) | **1.89** |
| Latent Heat of Fusion (in kJ/Kg) | **278** |