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**Research Article**

# ONION STORAGE

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**A R T I C L E I N F O**

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**A B S T R A C T**

Due to inadequate capacity of onion storage in our country compel us to create more low cost storage structures at the farmer's level. This article is a small effort in that direction. Various types of onion storage structures discussed in this article summarized from various sources and scientists.



## INTRODUCTION

India is one of the largest producers of onion in the world second only to China, accounting for 16 percent of world area and 10 percent of production. In India, it is grown on 0.39 million hectares with production of 4.30 million tonnes of bulbs per annum (FAO, 1995). The current year's production is estimated at 4.7 million tonnes. It is one of the most important vegetable crop of our country and forms a part of daily diet in almost all households. World output of onion is about 43 million tonnes. The notable producing countries are China, USA, USSR, Netherlands, Spain and Turkey. Most of the onion produced in India comes from the state of Maharashtra, Gujarat, Uttar Pradesh, Orissa, Karnataka, Tamil Nadu, Madhya Pradesh, Andhra Pradesh and Bihar. Maharashtra is the leading producer accounting for 20% of the area and 25% of the production.

The present storage capacity for onion is about 4.6 lakh tonnes. This is quite inadequate compared to our total production. Even most of the structures available are traditional and unscientific. If 40 % of the stocks are earmarked for scientific storage the potential for new storage structures is about 12.6 lakh tonnes. However, it has been projected by the Expert Committee on Cold Storage and Onion Storage that about 1.5 lakh tonnes on-farm capacity in production areas and 3.0 lakh tonnes capacity at APMCs (Agricultural produce market committee) and other market places are required in next 5 years. Thus there remains a vast potential to be tapped.

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### *Extent of Storage Losses*

The onion bulbs are generally stored from May to November for a period of four to six months. However, 50-90 per cent storage losses are recorded depending upon genotype and storage conditions. The total storage losses are comprised of physiological loss in weight (PLW) i.e. moisture loss and shrinkage (30-40%), rotting (20-30%) and sprouting (20-40%). The PLW can be minimized by harvesting at right time, proper curing of onion bulbs and subsequent storage at desired temperature and humidity conditions. Generally, the rotting losses are at peak in initial months of storage, particularly in June and July, when high temperature coupled with high humidity results in the losses. However, proper grading and selection of quality bulbs and good ventilation conditions can reduce the rotting losses. Application of post harvest fungicidal sprays can also reduce the rotting but this is not a practice in India. Sprouting losses are usually recorded at the end of storage period or when exposed to high temperature of humid air. Noticeable sprouting losses are observed because of storage of poor quality bulbs having less rest and dormant period and also having thick neck. Comparatively, more sprouting losses are recorded in dark red and white onion cultivars than the light red onion cultivars.

### *Storage method and storage environment*

The temperature and relative humidity are the prime important factors associated with storage of onion. A high relative humidity (more than 75%) is the biggest enemy of onion storage as it promotes root growth and development of storage diseases. In contrast the humidity (less than 65%) leads to excessive moisture loss from the bulbs, resulting shrivelling and loss of weight. The dormancy of bulbs, which inhibits sprouting, and it mainly depend on temperature. Sprouting is

high between 50°F to 200 °F. As far as the weight losses is concerned, it is less at 0-20 °F or moderately lower at 25-300 °F. The temperature of 5 to 250 °F and more than 300 °F increases the weight loss. Thus there are two distant temperature conditions and one defined humidity range suitable for safe storage of onions. Thus the onion storage structure should be planned and designed storage in such a manner that it can achieve and maintain the desired storage conditions in lowest possible cost within the available resources.

The onions are stored in heaps/stakes under ambient conditions in our country. Various types of structures are used for the storage of onion. Most of these structures are traditional type. Several modified onion storage structures has been design and tested. These structures help in reduction of storage losses. Many state government/ central government organizations are providing subsidy for the construction of modern type of storage structures. The different of onion storage structures are as follows:

***Traditional storage structure***

These structures have been developed by the farmers as per their requirements and availability of materials. These structures do not have bottom ventilation. These are constructed on wooden logs, bamboos with roof of grass or Mangalore tiles or asbestos sheets. These structures may have one or two rows /stakes of onions depending on the width of structure. These structures usually temporary type and the storage losses in these structures are more than 50% in four months of storage.

***Bottom ventilated storage structures***

These structures are permanent type and usually constructed with Galvanized iron framework. The floor consists of bottom ventilation and usually built with wooden bantams or bamboos. The sidewalls are also constructed with wooden bantams or bamboos. The roof is made with asbestos sheets. The additional aeration provided in this structure helps in reduction of losses. Generally the storage losses in this structure ranges from 30to 40% in 4 month of storage

***Top and bottom ventilated storage structure***

This is a distinct type of onion storage structure designed and tested by NRC (National Research Centre) for onion and garlic. This structure is constructed with G.I. framework. The floor is ventilated and constructed with wooden bantams. The sidewalls are made of bamboo and plastered with clay and cow dung paste. The ventilation is provided at lower portion of western sidewall and upper portion of the eastern sidewall. The lower portion ventilator of a western sidewall has control flaps to regulate the entry of hot winds in summer and high humid winds in rainy season. Plastered sidewalls control humidity in rainy days, while maintains inside temperature during summer. The structure can be constructed with 25 to 50 tonnes capacity. The cost of construction would be about Rs. 3600/tonne. The storage losses in this structure are 28-30% for four months of storage. This structure may better suit to humid and high temperature areas.

***Low cost bottom ventilated structure***

Low cost bottom ventilated structure has designed by NRC for onion and garlic for small and marginal farmers. This can easily constructed by farmers with their own farm resources. The structure is constructed with bamboo/wooden framework provided with bottom ventilation. The bottom and sidewalls can be made of bamboo or wooden bantams. The roof is made up of thatch from dried sugarcane leaves or grasses. The cost of structure would be around Rs. 800/ton. The storage losses in this structure are 30-35% for four months of storage.

***Points to be consider for construction of storage structures***

1. It should be constructed in such a manner so that it can maintain the required temperature and relative humidity.
2. The width of one stake should not be more than 4 feet. The maximum height and length should not be more than 5 feet to 15 feet respectively.
3. Bottom ventilated of 1 to 1 ½ feet should be provided for proper aeration.
4. The floor and sidewall should be constructed with wooden bantam or bamboos.
5. The roof should be constructed with asbestos sheet or Mangalore tiles or thatched galvanized iron sheet are not suitable for roofing material for storage structures.
6. The structures should be constructed at an elevated place. There should not be any water body around the storage. The single row should be constructed in North-South direction while double row structure should be constructed in East-West direction.

***Cold storage***

The onion can be stored under cold storage at 0-20 °F and 65-70% humidity. But cost and sprouting is the main problem in cold storage of onion. This problem of sprouting can be minimized by gamma irradiation treatment. The cold storage of onion is successful if combined with gamma-irradiation techniques.

***Improved Panipat Type Low Cost Onion Storage Structure***

NHRDF (National Horticulture Research & Development Foundation) has developed model design for two tier in Panipat and single tier in Nashik. This structure has adequate ventilation from all sides including bottom and hence reduce the storage losses. KVK, Ujwa (NHRDF) is popularizing this structure in onion growing areas of Delhi.

The improved low cost structure can be easily constructed by farmer, the structure is generally made of bamboo or sarkanda nets and the roof is thatched made of sirki, which is covered on top with jute cloth. The material of structure like bamboo/sirki, jute etc. is easily available in local market. The required size for storing 4 tons of onion is:

| Length | 20feet |
|---|---|
| Width | 4 feet |
| Side Height | 5 feet |
| Height (centre) | 6.5 feet |
| Height (from ground level) | 30 cm |

The low cost structure can be of different capacities having a life of 2-3 years with cost of Rs 7000 – Rs. 8000 for 4 tons capacity. The cost of structure varies with locally available material and labour.

***Features of improved Panipat type low cost onion storage structure***

1. Construction of structure on a raised platform with bottom ventilation to prevent moisture and dampness by avoiding direct contact to bulbs with the soil.
2. Increased centre height and more slope for better air circulation and preventing humid microclimate inside godown.
3. Bottom ventilation provides free and faster air circulation to avoid formation of hot and humid pockets between the onion layers.
4. Providing cubicles instead of continuous stack and sufficient space for ventilation for all sides
5. Avoid direct sunlight or rainwater splashes falling on onion bulbs to reduce sun scald, decay fading of colour and quality deterioration
6. Restriction on width of each stack to 60- 75 cm for cool humid weather, 75-90cm for mild and humid weather and 90-120 cm for mild and dry weather conditions.
7. Restriction of stacking height limits to 100 cm for small and multiplier onion for hot weather. 120 cm for mild weather and big onion to avoid pressure bruising.

## CONCLUSION

Better and improved technique and research is required for storing perishable items like vegetables by using modern tools like refrigeration and smart materials. These storage structures also give sufficient stability to the stored product (like Onion in this article). But Seasonal variations and ambient temperature plays a very important role in storage structures for onion. So while designing and constructing any onion structures ambient temperature, humidity and direction of Sun light needs to be considered.

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