

Postharvest Handling and Storage of Potato

Potato popularly known as 'King of vegetables', has emerged as fourth most important food crop in India after rice, wheat and maize. Indian vegetable basket is incomplete without Potato. It is an important part of breakfast, lunch and dinner worldwide. India is one of the highly populated nations in the world and to feed all of its population, no crop other than potato can make an impact. Currently, India is the third largest producer of potatoes in the world. The production level of the country hovers around 47 million tons.

The major potato growing states are Uttar Pradesh, West Bengal, Punjab, Bihar, Haryana, Madhya Pradesh, Gujarat and Maharashtra. More than 90% potato crop is grown in winter season (Rabi) under assured irrigation facility from October to March. The rest is being taken up during rainy season (Kharif).

(i) Nutritive Value: The constituents of potato per 100 gms

S. No.	Constituents	Weight (g)
1	Water	74.70
2	Carbohydrate (Starch and sugars)	22.60
3	Proteins	1.60
4	Fibre	0.40
5	Fat	0.10
6	Minerals	0.60

Source: Potato in India, Central Potato Research Institute (CPRI), Shimla

(ii) Harvesting:

- Follow the practice of dehauling cutting of haulms / aerial parts by sickle or destroying by machines, when the crop attains 80-90 days and when the aerial part of the plant turns yellow.
- Always harvest in dry weather.
- Stop irrigation about two weeks before dehauling.
- Avoid bruising and skinning of tubers otherwise tubers become susceptible to rot diseases.
- Harvest the crop after 10-15 days of haulm cutting.
- Harvesting can be done by tractor drawn potato digger or manually with help of spade or khurpi



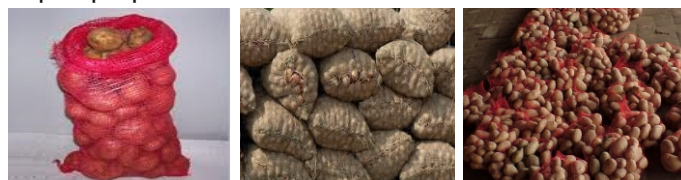
Fig.1. Harvesting of potato with digger

iii) Drying and Curing: The harvested potato should be cured in the field. For optimum suberization, curing is essential for healing the wounds of tubers resulted from cutting and bruising during harvesting. Exposure to sun causes the greening of potatoes. Always dry the harvested tuber in storage shed. All the damaged and diseased tubers should be removed during sorting.



Fig.2. Drying, curing and sorting

iv) Packaging: Handling and packaging of potatoes are done generally on farm. After harvesting, the tubers are kept in a heaped condition temporarily and covered with straw. After a few days, sorting is done for separating the diseased and cut tubers. The sound tubers are packed in hessian cloth bags or nettlon bags. The ordinary hessian bags are used for packing potatoes with a capacity of 80 kgs, 50 kgs and 20kgs. The nettlon bags made of plastic net are used to pack 25 kgs potato and preferred for export purpose.



Nettlon bag

Jute bag

Nettlon retail bag

Fig.3. Packaging of potato

(v) Storage: Storing potatoes for longer period at normal temperature is not possible as it is a living material and

through respiration, the changes occurs due to heat, resulting in loss of dry matter and ultimate deterioration of quality of tubers. The best temperature and humidity condition for storage of potatoes are as follows:

Types	Temp.(°C)	RH (%)	Remarks
Seed potato	0-2	90-95	No sprouting
Ware potato	0-2	90-95	Potato becomes sweet
Ware potato with CIPC fogging	10-12	90-95	No sprouting and no sweetness. Suitable for culinary and processing purposes and export depending on varieties. Save energy and running cost of cold stores

(vi) **Grading:** The different grades of potato as suggested by Directorate of Marketing and Inspection, Faridabad are as under:

Size Code	Equatorial diameter in mm.
A	18.1-28.0
B	28.1-45.0
C	45.1-65.0
D	65.1-80.0
E	more than 80

Note: The size code 'A' shall be marked as 'Baby Potato'.



Fig.4. Grading of potato

Grading plays an important role in marketing of potato. The potato should be packed in different bags as per recommended grades before marketing. Potato marketing in India suffers from severe constraints like wide price fluctuations, existence of large number of middlemen, storage and transportation bottlenecks and lack of other marketing infrastructures. Indian potato marketing system is not efficient, integrated and is not in a position to face the emerging challenges of potato production and utilization. Studies on marketing margins or price spread reveals that as the number of market functionaries increases, they add cost to the commodity in the marketing channel which results in the fall of producers show in consumer's rupee. Farmers are advised to make their own cooperative groups or Farmers Producers Organizations and follow standard postharvest handling practices for self marketing of produce. Various Government agencies like National Horticulture Board, National Horticulture Mission and Ministry of Food Processing and Industries provide financial assistance for creation of postharvest and cold chain infrastructure for horticultural crops.

Storage of potato with CIPC application-A potential technology for potato processing

Potatoes are mostly produced during the winter season from November to March, but are consumed year round. Therefore, storage of potato under optimum conditions is very important part of supply chain in order to avoid glut like situation in the market.

i) Problems of potato during storage: Sweetness, Sprouting, Decay

In general practice, the seed and ware potatoes are stored by the farmers at low temperature (0-3°C), which is ideal for suppressing sprouting, but physiological changes at this temperature results in accumulation of sugars in the tubers, giving sweetish taste resulting in lowering the culinary qualities of stored potatoes as well as making them unfit for preparation of french fries. Thus the stored potatoes fetches lower price in the market compared to 'Pahari' potatoes from hilly areas. Storage of potatoes at high temperature (10 ± 2°C and 90-95% RH) coupled with application of sprout- suppressant chemicals like CIPC is a viable technology, which can enhance the storage life, maintain the low sugar levels and improve culinary/ processing qualities in the potatoes during storage.

ii) What is CIPC?

Chlorpropham (Isopropyl – N (3- Chlorophenyl carbamates), popularly known as CIPC, is an effective sprout inhibitor. It acts by blocking the process of cell division (mitosis). In store, CIPC is currently applied as a hot fog of fine solid particles on the potatoes. The mechanism of action of the applied chemical is believed to involve volatilisation of the deposited solid and subsequent transport of the vapour to the eyes of the tubers inducing the required sprout suppression. This chemical currently is being marketed in India by United Phosphorus Ltd., Mumbai under the brand name 'Oorja™'. This commercial formulation is said to contain 50% active ingredient (a.i.) and 40 ml of this formulation is required for fogging of one tonne of potatoes.

iii) Procedure for CIPC application

- The disease free fully cured, mature tubers are loaded in the cold storage and temperature is maintained at 18°C during loading.
- Temperature of the storage is brought down from 18°C to 10°C gradually in one week.
- Chlorpropham fog is injected @ 40 ml/tonn using DYNA fogging machine into the storage chamber loaded with potatoes. The first fogging is done at the first sign of sprout growth and second fogging is done 60 days later.
- Refrigeration is not used when CIPC fog is flushed into store. For this, the refrigeration unit is switched off prior to, during and upto 40 hours after the treatment. Then doors are opened for half an hour after 40 hours to flush out the

accumulated gases. Thereafter the temperature of cold storage is maintained at $10 \pm 2^{\circ}\text{C}$ and 90-95% RH.

- The chamber should be completely leak proof to ensure that there is no loss of refrigeration during storage period; otherwise there will be more consumption of electricity to maintain uniform temperature.
- Humidity should be maintained at 90-95% level inside the chamber to avoid shrinkage in the treated potatoes. Humidifier should be installed to get optimum humidity level.



Fig.5. CIPC application with fogging machine

The studies on storage of four cultivars of potatoes viz. Kufri Jyoti, Kufri Chanderamukhi, Kufri Badshah and Kufri Satluj were carried out at Punjab Horticultural Postharvest Technology Centre. The potato tubers were fog treated with Oorza @ 40 ml /ton. The first dose was given just at the initiation of sprout growth and second 60 days later. During each fogging the refrigeration unit was kept off for 40 hours. After 40 hours the accumulated gases were flushed out from the chamber and temperature of the storage was maintained at $10 \pm 2^{\circ}\text{C}$ and 90-95% RH. It was noticed that these cultivars can be stored successfully upto 6 months without much loss of weight, texture and quality. The reducing sugars content of all the cultivars were found to be lower than normal cold stored potatoes.



Without CIPC application



With CIPC application



Chips from cold stored potato



Chips of CIPC treated potatoes

The potato stored at $10 \pm 2^{\circ}\text{C}$ and 90-95% RH coupled with CIPC application does not develop sweet taste and therefore are better than cold stored potatoes for culinary purpose. The tubers do not sprout, rot and remain firm and fresh for 6 months. Moreover, with this technology we can save about 40% of electricity cost as compared to conventional storage methods. Farmers, traders and processors can gain a lot from this storage technology.

As per reports from UPL Mumbai about 1.32 lakh MT potato tubers were stored in different district of Punjab with Oorza application during 2017-18.

PHPTC activities

(i) Training programme for Apni Mandi farmers: The Center organized five training programmes for Apni Mandi farmers in collaboration with Punjab Mandi Board on postharvest management, value addition and marketing of fruits and vegetables. The farmers from five districts viz Jalandahr, Hoshiarpur, Kharar, Fatehgarh Sahib and Malerkotla attended the training programmes. Apni Mandi is a very good concept started by Punjab Mandi Board with a view to give boost to small farmers around cities so as to provide direct access to the consumers by eliminating the middleman. This model helps not only in reducing the postharvest losses of perishable produce but consumers can enjoy the freshness of the quality produce and farmers can earn better profit as compared to wholesale market. The participants were made aware of techniques for grading, packaging, storage, value addition, Food Safety Act, and its ultimate importance for human health.



(ii) Moisture meter calibration and repair services: This Center has started the calibration and repair work of moisture meters for procurement of wheat in different mandis of Punjab. The hands-on- trainings for handling and maintenance of moisture meters were organized for mandi supervisors/auction recorders and other mandi officials.



OORJA[®]



4S
Party & Healthy



Potato with a Difference !!!



50 Lakh MT potatoes treated
with
"OORJA" Technology



"OORJA" Technology
for Table & Processware Potatoes



YOU CALL IT **FRESH**,
THE WORLD CALLS IT
DECC 

90 Years of providing
Post-harvest solutions

1/3 Fruits in the world are treated
with our post harvest technology

DECCO Controls Decay

CITRASHINE

CITRASHINE[®] is a fruit coating, formulated with purified natural secretion and water-soluble emulsifying agents. It does not contain any solvents but water and all ingredients are approved for use on foodstuff by the health regulation of most countries. **CITRASHINE**[®] provides stable, transparent and long-lasting shine which improves citrus fruits appearance resulting in increasing the market value. In addition, **CITRASHINE** controls dehydration and prevents from excessive weight loss.