

Post-Harvest Management Protocols

CABBAGE

The Cabbage is a popular cultivar of the species Brassica family and is used as a leafy green vegetable. Cabbage grown best in a cool moist climate and is very hard to frost. Cabbages are extensively cultivated throughout the country as an annual crop. India is the second-largest producer of cabbage in the world after China. The major cabbage producing states in India include West Bengal, Madhya Pradesh, Orissa, Bihar, Gujrat, Assam, Jharkhand, Haryana, Uttar Pradesh, and Chhattisgarh. West Bengal is the largest producer of them all. **Total production for the year 2017-18 was 9037.34 ('000MT).**



Cabbage varieties in India

- Copenhagen Market
- Pride of India
- Golden Acre
- Pusa Synthetic
- Quisor
- Summer Queen
- Pusa Drumhead
- September Early
- Pusa Ageti
- Pusa Mukta

disease. Unharvested cabbage may develop significant infestations of Alternaria leaf spot and downy mildew, particularly during wet weather. These diseases can be spread through normal harvesting and handling. Harvesting immature heads, however, reduces yield, and the heads are too soft to resist handling damage. Immature heads also have a shorter shelf life than mature heads.

Cabbage should be reaped during cooler times of the day, preferably in the early morning. Reaping is done by using a very sharp knife to cut the stem, about 2 cm below the base of the cabbage. This will allow 3 – 4 outer levels to remain intact, and which provide protection for the under layers or the edible portion of the cabbage. This process will ensure that a very green, hard, and fully developed head of cabbage reaches the consumer, and that both the quantitative and qualitative aspects of requirements are achieved.

Machine harvesting is much faster than hand harvesting, but unless extreme care is taken, machine harvesting can result in significant damage to the cabbage.

The head should not be removed by snapping or twisting it since this practice damages the head and results in inconsistent stalk length and trim. Broken stalks are also more susceptible to decay.

MATURITY INDICES

Harvesting of Cabbage is done when the heads are firm, in some parts harvesting is done earlier when the prices are high. Delaying harvest even a few days beyond maturity can result in split heads and increased incidence of field

GRADING

For grading cabbage, yellow, damaged or diseased leaves are removed. Extra leaves act as cushions during handling and may be desired in certain markets. Heads with insect damage and other defects should be discarded.

A uniform product is obtained by sorting out the heads according to size of the head, and quality. They should be

- Fresh in appearance, sound and intact
- Free of bursts and showing no signs of flower development
- Free of bruises and injury
- Free from pests and damage caused by pests
- Free of any foreign smell and/or taste.
- Cut ends should be clean and leaves should remain firmly attached.

Size Grading

Grade	Weight (Grams)
A	201-600
B	601-1200
C	1201 and above

Fresh, Firm, Compact, green to light green in color and two three external leaves covered and 500 g upto 2000 g average weight is usually considered of good quality.

PACKAGING

Harvested cabbage can be placed in bags, boxes, wagons, or pallet bins, depending on the harvesting method employed. In India, Cabbage is generally packed in Gunny bags, however it is recommended that packaging should be done in bamboo or wooden boxes because bags offer only minimal protection from rough handling. Cartons and crates are also easier to palletize, but they should be lined with 100-gauge polyethylene film.

STORAGE

Harvested produce should always be removed from direct sunlight and transported to the packing shed as soon as possible. Cabbage and leafy greens are particularly susceptible to wilting and other damage from high temperatures. When there is a delay of more than an hour or two between harvest and packing, a water drench or spray arrangement can help prevent dehydration and overheating.

Proper packing and cooling are essential to maintaining the freshness of cabbage. Freshness can be tested by rubbing two heads together; if they are fresh, they will make a squeaking sound. Cabbage should be cooled immediately after packing.

Before storage all the loose leaves should be trimmed away leaving heads with 3-6 tight wrapper leaves.

For storage upto 3-6 weeks, the optimum temperature of storing early harvested crop is 0° C with a relative humidity of 95-98% while the late harvested crop is stored at 0° C with 95% relative humidity. Late cabbage can be stored for 7-8 months at controlled atmosphere at 0° C with 2.5-3% O and 5% CO₂.

Storage Parameters

Recommended Temperature
(in degree Celcius)

0



Recommended Relative
Humidity (in %)

95



Shelf Life

3 to 4 months



Product Loading Density (in Pound/cu.ft)	-
Initial Freezing Point (in degree Celsius)	-0.9
Specific Heat Above Freezing Point in (kJ/Kg.K)	3.92
Specific Heat Below Freezing Point (in kJ/Kg.K)	1.99
Latent Heat of Fusion (in kJ/Kg)	307

Thermal properties of Cabbage

Initial Freezing Point (in degree Celsius)	-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