

Harvest Maturity Indices

The principal harvest maturity index for cabbage is based on size. Heading-type cabbage may be harvested as small as 10 cm (4 inches) in diameter and continued until 15 to 25 cm (6 to 10 inches). Harvest maturity for heading-types is also based on head compactness and firmness to the touch. A firm or compact head is mature and can be only slightly compressed with moderate hand pressure. A very loose head is immature and should not be harvested. Harvest maturity may also be based on arrangement of the wrapper leaves; when they are spread and the head is exposed it is usually mature. A mature cabbage has a well-developed head and good weight in comparison to its size.



Cabbage should be harvested promptly when the heads are firm and mature. Delaying harvest even a few days beyond maturity can result in split heads and increased disease pressure, particularly during wet weather. Pak choi type cabbage is usually ready for harvest within 7 weeks after transplanting, although this may vary according to cultivar and environmental conditions. Size is the principal indicator of harvest maturity and this is largely based on market demand. Pak choi should have well-formed upright petioles tightly adhering together. Pak choi should always be picked when leaves are fresh and crisp and before the outer leaves turn yellow.

Harvest Methods

Cabbage is harvested by hand by bending the head (or stalk in the case of pak choi) to one side and cutting it with a sharp knife or small machete. The cutting instruments should be sharpened frequently to reduce harvesting effort and lessen picker fatigue. The head should not be removed by snapping or twisting, as this damages the head and results in jagged appearing stems which are more prone to decay.



The stalk should be cut flat and as close to the head as possible, yet long enough to retain two to four wrapper leaves. Yellowed, damaged, or diseased wrapper leaves should be removed. Heads with severe insect damage and other defects should be discarded. In the case of pak choi types, any damaged or dead leaves should be removed and the base should be cleanly trimmed.

Cabbage should be put in baskets or well-ventilated picking containers and taken out of the field immediately after harvest. Harvest should occur during the coolest time of the day, preferably in the morning when the head is most turgid.

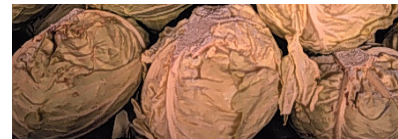
Preparation for Market

Cleaning

The first step in preparing cabbage for market is to remove the torn and loose outer wrapper leaves so the head has a clean, compact, and fresh appearance. Only 3 to 6 wrapper leaves should be left on the head. The stem end should be trimmed close to the base of the head so it does not protrude more than 2 cm (0.75in). A fresh cut of the stem end will be necessary if it is discoloured. However, it is important not to cut the stem end too short so part of the base of the head is cut. This will cause a loss of wrapper leaves and injury to the head.

Sorting

Cabbage should be sorted according to size, shape, and compactness of the head. There are 3 established size categories (small, medium, large) for domestic marketing of cabbage, based on the weight of the head. Small sized heads weigh 0.8 kg (1.7 lb) or less, medium sized heads weigh between 0.9 and 1.4 kg, (1.7 lb and 3 lb) and large sized cabbage heads weigh 1.5 kg (3 lb) or more. Only the cabbage with crisp and turgid leaves should be packed for market. The heads should be a colour typical of the cultivar (i.e. green, red, or pale yellow-green), firm, heavy for the size and free of insect, decay, seed stalk development and other defects.



Packing

Heading-type cabbages are generally packed in fiberboard cartons, wooden or wire-bound crates, or mesh bags holding

about 23 kg (50 lb). Uniformity of head size and the proper count per carton are important. Normally 18 to 22 heads are packed in a 23 kg container. Cartons and crates are easier to stack and load and provide considerably more protection to the cabbage than mesh bags.

Pak choi cabbage should be packed in fiberboard cartons usually holding between 10 to 18 kg (22 to 40 lb), depending upon market preference. Pak choi may be bunched into groups of 3 to 5 plants using a string or rubber band. Care must be taken to avoid leaf tearing.



Temperature Control

The optimal storage temperature for all cabbage types is 0°C (32°F). Chinese cabbage is more perishable than heading types and should be cooled within several hours after harvest and stored as close to the ideal postharvest temperature of 0°C as possible. The maximum market life of pak choi under ideal conditions is 2 weeks. At ambient temperatures the pak choi leaves will rapidly wilt and become unmarketable after only 1 to 2 days. The need for immediate cooling after harvest is not as necessary for heading types of cabbage. However, for maximum storage life, heading types should be cooled within a day after harvest. Market life at 0°C will be 4 to 6 weeks.

Deterioration of cabbage is accelerated under non-refrigerated temperatures and is associated with discolouration of the stem end, leaf wilting, loss of fresh green colour, and postharvest decay. Storing cabbage at ambient temperature will require extensive trimming of the leaves to maintain a marketable head.

Relative Humidity Control

Cabbage is a leafy vegetable prone to significant moisture loss and wilting after harvest. In order to minimize the loss of crispness and wilting of the leaves it is very important to maintain a high relative humidity (RH) during storage. The optimal RH for cabbage is 95%. Pak choi can be stored at 0° C for several weeks, as long as the relative humidity is greater than 85%.

Principal Postharvest Diseases

Storage diseases can be minimized by using clean and sharp cutting knives, careful harvesting and handling practices to prevent wounding of the leaf tissue, trimming off infected outer leaves, followed by storing the cabbage as close to 0°C as possible. In addition, the use of clean seed and pre-harvest application of fungicides will reduce inoculum and lower the incidence of postharvest diseases.

Bacterial Soft Rot

Infected tissue quickly decays and turns into a soft, slimy, foul-smelling mess at ambient temperatures. Development of bacterial soft rot at the cut stem end can be prevented by spraying with a 15% solution of alum (aluminum potassium sulfate) in water. After treatment, the stem end should be allowed to dry for 20 to 30 minutes before packing. Application of lime powder to the stem end will also help minimize the establishment of bacterial soft rot.



Phytophthora Rot

This disease is most severe on cabbage produced during the rainy season. Symptoms typically begin as a dark brown firm rot of the stem end, gradually progressing into the head. Cavities tend to form in the stalk tissue and sparse white mould strands may be observed. The decayed tissue produces a distinctive sour odour. Gray water-soaked blotches may also appear on the outer leaves.

Rhizoctonia Rot

This disease is favoured under wet conditions, especially when there is contact between the soil and the base of the cabbage head. Symptoms begin as sunken black lesions on the lower leaf midribs in contact with the soil. Circular spots later appear on the lower leaves. In addition, small irregularly shaped lesions may develop on the tops of the heads, gradually uniting and darkening. Eventually head rot may follow. As decay progresses, a dark mould spreads over the surface.

Watery Soft Rot

This disease is common on cabbage produced from poorly drained soils or during the rainy season. Symptoms appear as water-soaked spots on the outer leaves. The spots unite into a leaky soft tissue mass. Affected tissue often turns grey, giving rise to a fluffy white mould which is eventually dotted with black fungal bodies. In contrast to bacterial soft rot, there is no unpleasant odour associated with watery soft rot.

Postharvest Disorders

Yellowing

Storing cabbage at ambient temperature will result in a gradual loss of green chlorophyll pigment and yellowing of the outer leaves. Cabbage is also sensitive to ethylene, which causes both leaf yellowing and leaf shedding. Adequate ventilation during storage is important to maintain very low ethylene levels in the holding area. In addition, cabbage should not be stored in close proximity with fruit that emit high amounts of ethylene.

Black Leaf Speck

Symptoms begin with the development of individual specks, randomly distributed over the leaf. Initially the specks are small in size, but they may develop further in storage and unite into spots as large as 2 mm (0.08 in) in diameter. Symptoms can often be seen well into the center of the head.



For additional information contact:

New Guyana Marketing Corporation (NGMC)
87 Robb & Alexander Sts., Georgetown, Guyana
Tel: 226-8255, 226-2219

National Agricultural Research Institute (NARI)
Mon Repos, East Coast Demerara, Guyana Tel: 220 2950



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CABBAGE

Postharvest Care and Market Preparation Information Sheet



This information sheet provides growers and agriculture extension personnel with a summary of the recommended harvest and postharvest handling practices for cabbage. A more technical and detailed bulletin is available from the New Guyana Marketing Corporation (NGMC) and National Agricultural Research Institute (NARI).