Thoroughly cleaned before packing. Also, the ginger intended for then cured. Soil on the bulb should be removed and the roots and stem may have to be trimmed back. Ginger should be scrubbed by hand or with a soft-bristled brush in clean water sanitized with 150 variety. The internal flesh should be firm and uniformly cream or pale-yellow coloured, without any indication of darkening.

Packaging
Ginger of roughly similar size should be packed in each market container. The container should be strong, well-ventilated, and capable of being stacked without damaging the bulbs. For the domestic market, wooden crates provide better protection to the ginger than mesh or synthetic sacks. For the export market, ginger bulbs should be placed in a clean, strong, well-ventilated fiberboard carton. The surface of the bulbs should be thoroughly dry prior to packing. Ginger destined for export should be loosely packed in layers inside the carton. Net carton weight is typically 10 kg (22 lb) for the U.K. export market and 14 kg (30 lb) to North American destinations.

Harvest Maturity
The principal measurements used to determine ginger harvest maturity are age of the leaves and bulb size. Ginger should be harvested once the leaves begin to turn yellow and start to dry. This natural aging process typically begins between 7 to 9 months after planting. Delaying harvest until all of the leaves have died is not recommended as it will reduce bulb quality, increase fiber content, limit storage life, and increase sprouting.

In some markets, ginger harvested before the beginning of the natural aging processes may be of higher value. In this case, several randomly selected plants should be dug up to figure out average bulb size. If the size is acceptable, the remaining plants can be harvested. The drawback of harvesting less mature ginger is that bulbs are susceptible to greater weight loss.

Harvest Methods
Ginger is dug by hand using a fork or cutlass to loosen the soil around the crown of the plant. The process should be done carefully in order to avoid damaging the bulbs. The bulbs should be gently pulled out of the soil using the stem of the plant as a handle. Care should be taken not to injure the ginger, which has a delicate skin and is easily wounded during harvest and handling. Early harvested ginger will still have an actively growing green stem attached to the bulb which needs to be snapped or cut off slightly above the point of attachment to the bulb.

Excess soil and roots should be removed by hand before placing the bulbs in the field container. Cotton gloves are typically worn to facilitate field cleaning. Ginger should be pre-graded in the field and any unmarketable, damaged, or diseased bulb should be discarded.

The harvested ginger should be placed directly into strong well-ventilated wooden or plastic field crates for removal from the field. Transport of ginger in mesh sacks will result in skin damage due to rubbing of the delicate skin against the mesh.

Preparation for Market
Cleaning
Relatively clean bulbs sold in the domestic market may not require any further cleaning. However, ginger intended for export must be thoroughly cleaned before packing. Also, the ginger intended for long term storage should be washed immediately after harvest and then cured. Soil on the bulb should be removed and the roots and stem may have to be trimmed back. Ginger should be scrubbed by hand or with a soft-bristled brush in clean water sanitized with 150 ppm hypochlorous acid. The water should be changed after it builds up with soil particles.

A fungicide treatment can also be applied in the wash tank or as a separate overhead spray application after cleaning. Recommended fungicides are benomyl (500 ppm) or thiabendazole (1000 ppm). Benomyl (500 ppm) should be measured at 6.6 oz to 5 gal water (0.2 l benomyl to 19 l of water). Thiabendazole (1000ppm) should be measured as 13.2 oz to 5 gal waters (390 ml to 19 l). The ginger should be air-dried after cleaning.

Sorting
Remove all damaged and injured bulbs. The remaining marketable bulbs should be sorted according to size and overall appearance. The ginger surface should be clean, bright yellow-brown, and appear fresh. It should not be wilted or have any evidence of sprouting. The bulbs should be free from bacteria or fungal infection and not have any noticeable skin blemishes. High quality ginger is characterized by large thick bulbs with limited branching, light skin colour, and a glossy appearance. The skin colour will slowly darken and lose its shine during storage.

Market require that bulbs be large and well-formed with limited branching. The minimum bulb size for export is 250 g (9 ounces). There is no maximum size limit. The main stem should not be less than 3 cm (1.3 inches) thick and 12 cm (5 inches) long. Bulbs that have more than 4 side branches should not be packed for export. The skin should be tight and light brown. Export quality ginger should be smooth and firm, with uniform shape and size, be free from insect damage and decay, and have a uniform peel colour typical of the variety. The internal flesh should be firm and uniformly cream or pale-yellow coloured, without any indication of darkening.

Packaging
Ginger of roughly similar size should be packed in each market container. The container should be strong, well-ventilated, and capable of being stacked without damaging the bulbs. For the domestic market, wooden crates provide better protection to the ginger than mesh or synthetic sacks. For the export market ginger bulbs should be placed in a clean, strong, well-ventilated fiberboard carton. The surface of the bulbs should be thoroughly dry prior to packing. Ginger destined for export should be loosely packed in layers inside the carton. Net carton weight is typically 10 kg (22 lb) for the U.K. export market and 14 kg (30 lb) to North American destinations.

Curing
Ginger intended for storage should be cured by air drying the bulbs at average temperature, 22°C to 26°C, (71.5°F to 79°F) and 70 to 75% RH for several days to allow the skin to thicken and the cut surfaces to heal. Curing will help reduce postharvest weight loss and decay. Following this brief curing treatment, the ginger should be put in well-ventilated containers for long-term storage.

Temperature Management
The optimal temperature for storing ginger is 12.5°C (55°F). At this temperature, the bulbs will remain in marketable condition for at least 3 months, depending on initial bulb vigor and condition. Holding ginger at high average temperatures, 25°C to 30°C (77°F to 86°F) will result in high moisture loss, surface shriveling, and sprouting. Market life under these temperatures is less than 1 month. Sprouting may begin after several weeks at ambient temperature. Holding the bulbs at 12.5°C will prevent sprouting. At the other temperature extreme, ginger is very sensitive to chilling injury (CI) and should not be stored below 12.5°C. CI results in pitting and sunken spots on the bulb surface, shriveling, softening, flesh darkening, and postharvest decay.
The amount of damage depends on the temperature and the duration of exposure. Uncured bulbs are more susceptible to CI and 2 weeks of exposure at 7°C (44.5°F) will result in significant bulb damage.

Relative Humidity

Dehydration is a common postharvest disorder of ginger held under low relative humidity (RH) conditions (i.e. less than 65% RH). Shriveling of the bulb becomes noticeable after the loss of more than 10% of the initial harvest weight. On the other hand, surface mould will begin to grow at a RH above 90% and sprouting will be stimulated, especially if the temperature is above 16°C (61°F). In order to minimize weight loss but avoid surface mould, a compromise RH range of between 70% to 75% is recommended for storing ginger. Ginger stored at 22°C (71.5°F) and 70% RH for 3 months will lose about 20% of its initial weight.

Principal Postharvest Diseases

Ginger is vulnerable to a number of postharvest diseases, mostly associated with tissue injury following rough harvesting and handling practices. Decay can be kept to a minimum by following careful harvesting and handling practices, sanitation of the wash water, curing of the bulbs after washing to promote wound healing, application of a postharvest fungicide, and storing the bulbs at 12.5°C and 70% to 75% RH.

Blue Mold

Blue mould generally requires moisture condensation on the bulb surface, or storage at a RH above 95%. Mild surface infestations may be superficial and not cause decay. Blue mould that develops on cut ends and injured areas will typically result in internal tissue decay. The rotted tissue is pale to dark brown, and may be firm or soft.

Dry Rot

Symptoms of dry rot include off-coloured dry sunken spots on the bulb surface, typically bordered by a brown margin. The fungus may eventually invade the entire bulb, which becomes brown, dry, and shriveled. In humid environments, the ginger surface may become covered with a thick white mould. Internal signs include a pale brown discoloration of the vascular tissue.

Watery Rot

Symptoms include a soft, watery rot that progresses rapidly and may rot an entire bulb in a week. Infected tissue becomes brown and soft, and in a humid atmosphere the infected area is soon covered with large amounts of white mould. The mould will eventually turn black. The fungicide 2,6-dichloro-4-nitroaniline (Botran) applied prior to packing may reduce watery rot during transport to export markets.

Pythium Rot

This rot is common on ginger harvested during the rainy season or on bulbs grown in poorly drained soils. Symptoms appear as small brownish spots on the skin, which may rapidly enlarge into sizeable lesions. As the decay progresses, the tissue breaks down into a soft and watery mass.

Bacterial Soft Rot

Signs of bacterial soft rot include a soft wet rot, which has a strong foul odour. The ginger bulbs collapse into a slimy mass of leaky tissue which spreads rapidly at average temperature.

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