Netted Melon

Krista C. Shellie and Gene Lester
Lester and Shellie were with the Kika de la Garza Subtropical Agricultural Research Center, Agricultural Research Service, U.S. Department of Agriculture, Weslaco, TX. Lester is now with the Food Quality Laboratory, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, MD. Shellie is now with the Horticultural Crops Research Laboratory, Agricultural Research Service, U.S. Department of Agriculture, Parma, ID.

Scientific Name and Introduction

Cucumis melo L. (Reticulatus group), commonly called cantaloupe or muskmelon, is a member of the Cucurbitaceae family (Bailey et al. 1976). True cantaloupes, members of the Cantaloupensis group, are nonnetted fruit common to Cantaluppi, Italy, and are seldom grown in the United States. Western Shipper melons (grown in Arizona, California, and Texas) are grown principally for domestic and export markets, while Eastern Choice melons (grown in the eastern United States) are more perishable and are used principally for local consumption. A heavy, uniform, tan-colored net and bright orange flesh characterizes the external appearance of Western Shipper and Eastern Choice melons. Eastern Choice melons are often deeply sutured, while Western Shipper melons usually lack sutures.

Charentais, galia, ananas, and Persian melons are not commonly grown in the United States, but are gaining popularity as specialty melons. The French Charentais is a round, sparsely netted melon with a grey-green rind having pronounced dark-green longitudinal tracts; it has a sweet, highly-scented, orange flesh. Galia melons from Israel are characterized by a fine, uniform net, round shape, and green flesh (Karchi and Govers 1977). Ananas melons have a sparse, cracked net and white, very sweet flesh. The shape and netting of Persian melons are similar to those of Western Shipper type melons, but Persian melons are larger, about 6 lb (2.7 kg) each, and have a bright, orange-pink flesh.

Quality Characteristics and Criteria

To meet U.S. grade standards, melons must have sufficient maturity to ensure completion of ripening, sufficient firmness (not soft or wilted), shape and netting characteristic for their type, a stem scar not wet and slippery (wet slip), no sunscald (solar injury), flesh and rind free of decay by fungi or bacteria, and absence of damage (USDA 1981). Damage includes liquid in the seed cavity, hail injury, surface mold, aphid honeydew, scars, cracks, ground spot rind disorders, bruises, and mechanical damage. A minimum SSC of 11% and 9% is required for U.S. grades Fancy and U.S. No. 1, respectively. State market-order quality standards may exceed Federal grade requirements.

Horticultural Maturity Indices

Stem separation and background rind color are used to indicate acceptable maturity for harvest. As netted melons begin to ripen, a separation layer, or abscission zone, develops at the point where the stem attaches to the fruit. Most netted melons are commercially harvested when half of the stem has separated from the melon (referred to as half-slip) (Kasmire et al. 1970). Abscission

zone development often corresponds to a change from green to yellow in rind background color. If picked at proper maturity, netted melons will continue to soften and become more aromatic after harvest (Shellie 1995, Ayub et al. 1996). Netted melons harvested prematurely by cutting the stem prior to abscission-zone development may produce little aroma, have low SSC, and do not properly ripen (Lyons et al. 1962).

Grades, Sizes, and Packaging

U.S. Grades for cantaloupes (USDA 1981) include U.S. Fancy, U.S. No. 1, U.S. Commercial, and U.S. No. 2. The difference among grades reflects levels of tolerance for quality criteria. A minimum SSC of 11% is required for U.S. Fancy and 9% for U.S. No 1. There are six common size classes (9, 12, 15, 18, 23, and 30) based on the number of fruit of uniform size and weight that fit into a standard 40-lb (18-kg) cardboard shipping box.

Precooling Conditions

Precooling to a fruit center temperature of 10 to 15 °C (50 to 59 °F) soon after harvest is recommended to delay ripening and retain sugar content. Hydrocooling, forced-air cooling, and top-icing are acceptable, but hydrocooling is most efficient (Kader 1992).

Optimum Storage Conditions

Optimum is 2 to 7 °C (36 to 45 °F) with 95% RH (Saltveit 1997). The expected shelf-life at these recommended conditions is 10 to 14 days.

Controlled Atmosphere (CA) Considerations

CA in transit or storage has some potential for extending shelf-life. The recommended level of O_2 is 3 to 5% for reducing respiration and ethylene production. The recommended level of CO_2 is 10 to 20% for reducing loss of sugar and inhibiting surface mold. Storage in an atmosphere containing >10% CO_2 may result in a carbonated taste that is lost during subsequent storage in air. Off flavors, odors, and impaired ripening may develop if netted melons are stored in <1% O_2 or >20% CO_2 (Kader 1992, Saltveit 1997).

Retail Outlet Display Considerations

The shelf-life of netted melons can be maximized by storage under refrigeration and by avoiding postharvest exposure to ethylene.

Chilling Sensitivity

Sensitivity decreases as fruit mature. Full-slip, netted melons may be stored for 5 to 14 days at 0 to 2 °C (32 to 36 °F). Less mature melons may be damaged by storage at <2 °C (36 °F). Injury symptoms include pitting, surface decay, and failure to ripen (Wang 1990).

Ethylene Production and Sensitivity

Netted melons are climacteric fruit that produce 10 to 100 µL kg^{-1} h^{-1} ethylene (Kader 1992) from 4 days prior to stem separation to as late as 10 days after harvest (Shellie and Saltveit 1993, Shellie 1995). Postharvest exposure to ethylene reduces shelf-life and should be avoided. Exogenous ethylene application after harvest will not ripen netted melons harvested prematurely, nor will it prevent normal postharvest decline in SSC.

Respiration Rates

Netted melons have a moderate rate of respiration (Kader 1992).

Temperature	mg CO_2 kg^{-1} h^{-1}
0 °C	5 to 6
4 to 5 °C	9 to 10
10 °C	14 to 16
15 to 16 °C	34 to 39
20 to 21 °C	45 to 65
25 to 27 °C	62 to 71

Data from Sholz et al. (1963).

To get mL CO_2 kg^{-1} h^{-1}, divide the mg kg^{-1} h^{-1} rate by 2.0 at 0 °C (32 °F), 1.9 at 10 °C (50 °F), and 1.8 at 20 °C (68 °F). To calculate heat production, multiply mg kg^{-1} h^{-1} by 220 to get BTU ton^{-1} day^{-1} or by 61 to get kcal $tonne^{-1}$ day^{-1}.

Physiological Disorders

Solar injury causes patchy ground color, or "bronzing," and net discoloration. Severely injured tissue becomes sunken or wrinkled (Snowdon 1992). Vein track browning, a darkening of the longitudinal tracts between netted areas, is caused by exposure to sun or high temperature at harvest (Snowdon 1992). Netted melons are easily injured and should never be dropped more than 60 cm (2 ft). Harvest and packing equipment should be padded to reduce scuffing of netting (Ryall and Lipton 1979). Avoidance of wounding during handling (compression, bruising, or scuffing) and storage under recommended conditions provides protection against physical injury and decay.

Postharvest Pathology

Fusarium rot is the most common disease (Zitter et al. 1996). Symptoms vary depending on *Fusarium* species, but large fissures and an enlarged or thickened, dark-tan net at the lesion site is common. A distinct delineation is apparent between diseased and healthy tissue. There is often no sign of infection before harvest, but numerous spongy white lesions may develop internally postharvest. Fungicide application in a hot-water dip, 1 min at 57 °C (135 °F), can suppress fusarium fruit rot. Other less common diseases include black rot incited by *Didymella bryoniae* or *Phomopsis cucurbitae*, rhizopus soft rot *(Rhizopus stolonifer)*, bacterial brown spot *(Erwinia ananas)*, bacterial soft rot *(Erwinia carotovora)*, and alternaria rot *(Alternaria alternata)*.

Quarantine Issues

Melons entering the United States must be disinfested of external feeders (noctuid moths, thrips, and *Copitarsia* species) by fumigation with methyl bromide (APHIS 1998). Methyl bromide was identified in 1987 as having an ozone-depleting potential of 0.4 and is scheduled for global phase-out under the Montreal Protocol. Title VII of the U.S. Clean Air Act required phasing out production and importation of substances with ozone-depleting potentials of 0.2 or greater. Use of methyl bromide for preshipment and quarantine is exempt from these restrictions, but limited supply and increased costs may make methyl bromide undesirable in the near future.

Suitability as Fresh-Cut Product

Harvest maturity, cultivar, growing location, cultural practices, and postharvest handling influence quality of the processed product. Netted melons destined for fresh-cut sale should be harvested at the earliest maturity acceptable for minimum sugar content and proper ripening and be precooled immediately after harvest. Firm cultivars should be selected that have a high sugar content, bright orange flesh, and small cavity—that is, a high piece yield. Melons should be rinsed in 200 µL L^{-1} of 5.25% NaOCl at 5 °C (41 °F) at pH 6.5 to 7.0 for 5 min. The whole melon is cut into cubed pieces with sharp blades. Pieces should then be rinsed with 150 µL L^{-1} of the above chloride solution at 5 °C (41 °F) for 30 sec prior to packaging. A shelf-file of 6 to 10 days can be expected for orange-fleshed melon cubes stored at 0 to 5 °C (32 to 41 °F). A modified atmosphere of 8 to 10% CO_2 in air is beneficial for retarding microbial growth, as well as slowing softening and other quality changes.

Special Considerations

Use of liners in cardboard shipping boxes may reduce fruit moisture loss and extend storage life (Lester and Bruton 1986).

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