Diurnal Growth Measurements of Honeydew and Muskmelon Fruits

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Growth patterns of many fruits exhibit a diurnal rhythm, as manifested in apple (*Malus domestica* Borkh.) (Tromp, 1984), cherry (*Prunus avium* L.) (Kozłowski, 1968), pear (*Pyrus communis* L.) (Kozłowski, 1971), and orange (*Citrus sinensis* L.) (Chaney and Kozłowski, 1971), as well as in potato (*Solanum tuberosum* L.) tubers (Stark and Halderson, 1987). Expansion occurs during the night and shrinkage during the day. Fruit tissue shrinkage results from both transpiration and retranslocation of water to the plant, and its amplitude is dependent upon both solar radiation and vapor pressure deficit; as a result, shrinkage does not occur at humidities above 90% (Tromp, 1984). Tomato fruits, however, grow most rapidly during the day, with shrinkage at night (Ehret and Ho, 1986), demonstrating that not all fruits follow the same diurnal growth rhythm. Cucurbit fruit growth pattern is sigmoidal (Sinnott, 1945) and muskmelon ovary growth has been analyzed (Jenni et al., 1996), but I know of no report on the diurnal growth rhythm of muskmelon fruits. This study was conducted to record the diurnal growth rhythm of hybrid *Cucumis melo* L. var. *reticulatus* (netted muskmelon) and *inodorus* (honey dew) fruits from anthesis through abscission. Knowledge of the diurnal rhythm during fruit growth and development is critical to studies and practices involving environmental effects on nutrient and carbohydrate translocation.

Seeds of 'Explorer' netted muskmelon and 'Honey Brew' honeydew melon were planted in a greenhouse in 15-L black plastic pots containing Sunshine mix #4 (Sun Gro Horticulture, Bellevue, Wash.). Pots were irrigated as needed with 20N-20P-20K or 9N-45P-15K nutrient solutions during vegetative growth and flowering stages, respectively. Plants were maintained under a 12-h photoperiod supplied by 300 $\mu\text{E}\cdot\text{s}^{-1}\cdot\text{m}^{-2}$ radiation, utilizing 400-W, high-pressure sodium-vapor lamps. Flowers were hand-pollinated, and one

fruit per plant was allowed to develop. Day/night average temperatures were $30 \pm 7^\circ\text{C}/21 \pm 6^\circ\text{C}$ and average humidities were $72 \pm 10\%/98 \pm 2\%$. From 10 d after anthesis until abscission, the longitudinal and equatorial circumferences of 15 fruits per cultivar were measured at 0700 (measuring nighttime expansion) and at 1800 HR (measuring daytime expansion).

The sigmoidal growth pattern for both honeydew and muskmelon fruits (Fig. 1) is typical for cucurbits (Sinnott, 1945). For both melon cultivars, fruit circumference expanded during the entire 24 h, but growth was significantly greater during the night than during the day. Thus, growth in equatorial circumference is hyperbolic and continuous. Tukey (1964) also found that cucumber (*Cucumis sativus* L.) fruit circumference expanded continuously during the entire 24-h period, and growth was greater during the night than during the day. In potato, tuber circumference increases only in the early morning hours; during early evening

hours significant shrinkage occurs (Stark and Halderson, 1987). Muskmelon fruits may differ from other fruits, including cucumber, in that they expand until abscission, but during the last 7 to 10 d of growth, circumference increased only at night.

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Fig. 1. Average increase in equatorial circumference (●) and average night and day (diurnal) increase in circumference of (A) netted orange-flesh (muskmelon) and (B) green-flesh (honeydew) fruit. Circumference night increase was measured at 0700 HR (—○—) and day increase at 1800 HR (—▼—) from 10 d after anthesis until abscission. Bars represent $\pm$ SE.

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