Evaluation of U.S. Honeydew-type Melons for Resistance against Downy Mildew and Alternaria Leaf Blight

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Additional index words. *Cucumis melo*, *Alternaria cucumerina*, *Pseudoperonospora cubensis*

Abstract. Seventeen U.S. honeydew-type cultivars of melon (*Cucumis melo* L.) and three control cultivars were evaluated in replicated, artificial inoculations under controlled conditions for resistance against downy mildew and Alternaria leaf blight. All cultivars tested were susceptible to downy mildew. However, all of the tested cultivars were significantly more resistant to Alternaria leaf blight than the susceptible control. Twelve of these cultivars were not significantly more susceptible to Alternaria leaf blight than the two resistant controls. These cultivars may provide useful sources of Alternaria leaf blight resistance for incorporation into other commercial melon types.

Downy mildew incited by *Pseudoperonospora cubensis* (Berk. & M.A. Curtis) Rostovzev and Alternaria leaf blight incited by *Alternaria cucumerina* (Ellis & Everh.) Elliot are important diseases of melon worldwide (Thomas, 1982; Thomas et al., 1990). These diseases are prevalent in production areas during periods of high humidity often accompanied by frequent rainfall (Thomas, 1982; Thomas et al., 1990). Although the principal method of controlling these diseases is the use of protective fungicides, resistant cultivars are desirable because of increasing environmental, economic, and energy conservation concerns. We have evaluated U.S. cultivars of cantaloupe (*C. melo* var. *cantalupensis*)-type netted melons and *C. melo* accessions from various groups in the U.S. Plant Introduction (PI) collection to identify sources of resistance to downy mildew (Thomas, 1982; Thomas and Jourdain, 1992). Results of evaluations for Alternaria leaf blight resistance have been reported for only a few *C. melo* PIs and cultivars (Carmody et al., 1985; Thomas, 1984). This paper reports the evaluation of U.S. honeydew (*C. melo* var. *inodorus*)-type melon cultivars for resistance to downy mildew and Alternaria leaf blight.

Materials and Methods

Seeds of 17 test cultivars (Table 1) and three standard resistant or susceptible control cultivars of *C. melo* used in previous evaluations for resistance against these diseases were planted in Jiffy-7 (Jiffy Products Co. of America, West Chicago, Ill.) peat pellets and grown to the two-expanded leaf stage in a glasshouse. In evaluations for resistance against each disease, randomized complete-block tests of four replicates of 10 plants each were used and each test was repeated once. For downy mildew evaluations, the cultivar Ananas Yokneam was the susceptible control and breeding line MR-1 was the resistant check (Thomas, 1982; Thomas et al., 1987; Thomas and Jourdain, 1992). For the Alternaria leaf blight evaluations, 'Ananas Yokneam' and MR-1 were the resistant controls and 'Perlita' was the susceptible control (Thomas, 1984; Thomas et al., 1990).

For downy mildew inoculations, inoculum of an isolate of *P. cubensis* obtained from and maintained on melon was prepared and applied according to Thomas and Jourdain (1992). After inoculation, plants were placed in dark dew chambers at 20 °C for 18 h. Plants were then returned to the glasshouse bench for 5 d under natural illumination in fluctuating temperatures of 22 to 38 °C. On the 6th d after inoculation, plants were returned to the dark, 20 °C dew chambers to enhance sporulation. On the 7th d after inoculation, plants were removed from the chambers and each was rated for downy mildew reaction type (RT) (Thomas et al., 1987) using a stereo microscope to observe sporulation and lesion type. Reaction types were assigned on a scale of increasing plant resistance to downy mildew, in which: RT 1 = 10 to 15 mm in diameter, irregular, chlorotic lesions with abundant sporulation that may extend beyond the apparent margins of the lesions; RT 2 = type "1" lesions mixed with type "3" lesions; RT 3 = 3

to 4 mm in diameter, irregular to circular, chlorotic lesions with water-soaked margins beneath and sparse sporulation; RT 4 = 1 mm in diameter, circular, chlorotic lesions with necrotic centers and water-soaked margins beneath and extremely limited or no readily apparent sporulation.

The *A. cucumerina* isolate used for these studies was obtained from commercial melon in Hidalgo County, Texas, in 1981. It was cultured and inoculum was prepared and applied as described previously (Thomas et al., 1990), except that an inoculum concentration of 1.0×10^4 conidia/mL was used. Following inoculation, plants were placed in dark dew chambers at 20 °C for 16 h. Upon removal from the dew chambers, they were placed outdoors in direct sunlight for 8 h (Thomas et al., 1990). Each night thereafter, plants were placed in the dark, 20 °C dew chambers for 16 h to enhance lesion development, and returned to a glasshouse bench for 8 h during the day under natural illumination and where temperatures fluctuated between 22 and 38 °C.

On the 8th d after inoculation, plants were rated on a 1 to 5 scale of increasing resistance to Alternaria leaf blight where: 1 = leaves necrotic with few to many large, rapidly expanding lesions; 2 = leaves chlorotic with few to many large, rapidly expanding lesions; 3 = leaves green, but with few to many large (>6 to 8 mm), expanding lesions; 4 = leaves green with few to many moderate-sized (<5 to 6 mm), expanding lesions; 5 = leaves green with few to many restricted, small (1 to 2 mm) nonexpanded lesions. The ratings for each plant were used to calculate a weighted disease index for each cultivar as previously reported by Thomas and Jourdain (1992).

Table 1. Disease indices of U.S. honeydew-type melon (*Cucumis melo* L.) cultivars following artificial inoculation with *Alternaria cucumerina*, the incitant of Alternaria leaf blight.

Cultivar	Disease index ^a
Earliden	4.5
Green Flesh Honey Dew	4.8
Honey Dew Golden Flesh	5.0
Honey Dew Green Meated	4.7
Honey Dew Orange Flesh	4.6
Honey Dew Gold Rind	5.0
Honeycream	4.8
Juan Canary	4.6
Morning Dew F ₁	4.4
Morning Ice F ₁	4.8
Orange Blossom Hybrid	4.3
Rocky Sweet Hybrid	5.0
Sharlyn	4.8
Sheer Delight	4.8
TAM ^b Dew	5.0
TAM ^b Dew Improved	5.0
U.C. ^c Honeyloupe	4.9
Ananas Yokneam (resistant control)	5.0
MR-1 (resistant control)	5.0
Perlita (susceptible control)	2.7
LSD* (0.05)	0.3
CV (%)	4.1

^aWeighted disease indices based on a 1 to 5 scale of increasing resistance to Alternaria leaf blight (see text).

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*LSD ($P = 0.05$) = ± 0.3 .

Received for publication 13 Sept. 1996. Accepted for publication 25 Feb. 1997. Mention of a trade name or a proprietary product does not constitute a guarantee or warranty of the product by the U.S. Dept. of Agriculture and does not imply approval of it to the exclusion of other products that also may be suitable. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

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Results and Discussion

In the downy mildew evaluations, all plants of the tested honeydew-type cultivars and the susceptible control, 'Ananas Yokneam', exhibited RTs of 1, while the resistant control (MR-1) exhibited an RT of 4 (data not shown). While some differences were noticed between cultivars in the intensity of sporulation, all cultivars tested exhibited abundant sporulation typical of an RT of 1 and were therefore considered susceptible.

All honeydew-type cultivars tested for *Alternaria* leaf blight reaction were significantly more resistant than the susceptible control, 'Perlita' (Table 1). However, 'Earlidew', 'Honey Dew Orange Flesh', 'Juan Canary', 'Morning Dew F₁', and 'Orange Blossom Hy-

brid' were more susceptible than the resistant controls, 'Ananas Yokneam' and MR-1.

Most of the honeydew-type cultivars evaluated in these tests had high levels of resistance to *Alternaria* leaf blight and could be used as sources of resistance to this disease. In contrast, all honeydew types evaluated against downy mildew were susceptible. Incorporation of downy mildew resistance into honeydew types will require the use of *C. melo* sources of resistance such as PI 124112 or MR-1 (Thomas and Jourdain, 1992). Although of generally poor fruit quality, these sources of resistance do have some desirable honeydew-like characteristics (i.e., smooth rinds and failure of fruit to abscise at maturity), which may favor development of resistant honeydew germplasm with satisfactory fruit characteristics.

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