Air pollution can cause significant damage on leaves of field-grown watermelons (*Citrullus lanatus* [Thunb.] Matsum and Nakai) and muskmelons (*Cucumis melo* var. *reticulatus*). The air pollution-induced injury on melons observed in several midwestern and eastern states is principally caused by ozone. Ozone is produced in air during the daylight hours from chemicals released from automobile exhausts and the combustion of fossil fuels (oil and coal) (Figure 1). During the summer months, ozone concentrations in several regions of Indiana have been recorded at levels that could cause injury to crops susceptible to air pollutant injury. Other crops in which ozone injury has been observed in Indiana include potatoes, string beans, tobacco, soybeans, and squash.
1. Formation of the air pollutant ozone

Diagnosis and Identification

The injury on the watermelon leaves consists of premature chlorosis (yellowing) of the upper surface of the older foliage (Figure 2). The foliage later becomes necrotic (brown or black) (Figure 3), with white spotty patches within the necrotic areas (Figure 4). Ozone injury on muskmelon is similar, except that foliar discoloration on the upper areas goes directly from yellow (Figure 5) to bleached white (Figure 6).

Watermelons appear to be much more susceptible to visible injury caused by air pollution than are muskmelons. Ozone injury on watermelons generally appears in mid to late July prior to fruit maturation.

The injury pattern on the foliage is initially observed on older mature leaves near the crown or center of the plant, often progressing with time to the younger, more vigorous foliage. The yellowing of the plant centers in rows of watermelons is quite distinct and can give fields a visibly striped pattern of alternating yellow and green bands (Figure 7). In other states, this type of injury on watermelon has been descriptively referred to as "center of the crown dieback." In contrast, injury on muskmelons is typically much less severe and is visible at a later stage of plant development. Air pollution-induced injury on watermelons and muskmelons has been experimentally verified in the laboratory.
2. Initial stage of ozone-induced foliar injury on field-grown watermelon

3. Intermediate stage of ozone-induced foliar injury on field-grown watermelons (Greatest injury on mature leaf)

4. Advanced stage of ozone-injury on watermelon
5. Initial stage of ozone-induced foliar injury on muskmelon

6. Advanced stage of ozone-induced foliar injury on muskmelon

7. Yellowing of the center of the watermelon rows

Solution

Melon cultivars (cultivated varieties) tolerant and susceptible to injury caused by ambient air pollutants have been identified (Table 1). Tolerant cultivars should be chosen for planting in areas in which air pollution appears to be a problem. However, the selection of a particular cultivar should be based upon many considerations, including its performance (growth,
yield, and fruit quality), disease resistance, and marketing opportunities.

Table 1. Relative Ratings of Melon Cultivars' Susceptibility to Air Pollution Injury

<table>
<thead>
<tr>
<th>Tolerant*</th>
<th>Relative Ratings</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Intermediate</td>
<td>Susceptible</td>
</tr>
<tr>
<td>Watermelon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charleston Gray</td>
<td>Chilean Black</td>
<td>Crimson Sweet</td>
</tr>
<tr>
<td>Jubilee</td>
<td>Mirage</td>
<td>Madera</td>
</tr>
<tr>
<td>Picnic</td>
<td>Tender Sweet</td>
<td>Sugar Baby</td>
</tr>
<tr>
<td>Supersweet</td>
<td>Orange Flesh</td>
<td>Moran</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Petite Sweet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blue Belle</td>
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<tr>
<td>Muskmelon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top Mark</td>
<td>Summet</td>
<td>Superstar</td>
</tr>
<tr>
<td>Hy-mark</td>
<td>Laguna</td>
<td>Earlisweet</td>
</tr>
<tr>
<td>Saticoy</td>
<td>Mission</td>
<td>Harper Hybrid</td>
</tr>
<tr>
<td>Supermarket</td>
<td>Goldstar</td>
<td></td>
</tr>
<tr>
<td>Classic</td>
<td>Hiline</td>
<td></td>
</tr>
</tbody>
</table>

*Several cultivars are classified as tolerant rather than resistant because the visible injury that can be observed is at a much reduced level.

Evaluated at the Southwest Purdue Agricultural Research Center, Vincennes, IN during the 1984 and 1985 growing season.

Great care is necessary when diagnosing air pollution injury, however, because ozone symptoms closely resemble those induced by nutrient stress and by biotic pathogens (Table 2). Leaf tissues suspected of having injury caused by air pollution should first be analyzed for nutrient content and examined for the presence of pathogenic organisms.

Table 2. Symptoms Which May Be Confused with Air Pollution Injury

If symptoms are similar to those caused by OZONE

CHECK FOR:

- Mn toxicity (due to low soil pH < 5.5)
- N, P, Mg, B, Fe deficiency
- Moisture stress
- Leaf disease caused by other organisms
- Insects (mites, thrips)
- Pesticide Toxicity
- Virus Infection

If symptoms are similar to those caused by SULFUR DIOXIDE

CHECK FOR:

- N, K, Mn, Mg, Ca deficiency
- Moisture stress
- High temperature
Pesticide toxicity
Leaf diseases caused by other organisms


References for Further Technical Information

To obtain copies of the Station Bulletins cited here, contact: Extension Office, Department of Horticulture, Purdue University, West Lafayette, IN 47907.

Air Pollution and Melons


Air Pollution in Indiana

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