

## EDEMA

Edema is a common physiological disorder of ornamental and vegetable bedding plants in the condition of high relative humidity, low light intensity, cool air temperatures, and poor ventilation. It is likely to occur in greenhouses during periods of prolonged cool, cloudy weather conditions in winter and early spring. Plants that are very susceptible to edema include geranium, begonia, pansy, cleome, viola, tomato, pepper, cabbage, and broccoli.

### SYMPTOMS AND DIAGNOSTICS

The initial symptom of edema appears small water-soaked blisters on the lower side of leaves, and then they become raised, warty, scaly appearance (Figure 1). As blisters develop and merge, affected leaf tissues turn yellow or brown, which is also noticeable on the upper side of the leaf (Figure 2). In some cases, edema may cause large necrotic lesions (Figure 3) that often resemble fungal



Figure 1. Water-soaked blisters and corky spots on the lower side of a geranium leaf.

or bacterial leaf spots. Edema is most common on leaves, but blisters also occur on petioles and stems. On tomato transplants, edema can cause distorted petioles (Figure 4) and blistered stems (Figure 5). In most cases, the new growth of affected plants often recovers from edema, but severely affected plants may cause economic losses (Figure 6).

### DIEASE DEVELOPMENT

Edema occurs when water that is taken up by plant roots is more than it is evaporated through the leaves. The favorable conditions for edema development are a combination of warm and wet growing media, cool night air temperatures, and high relative humidity. Excess water in plant cells results in abnormal expansion of the cell and even splits or cracks of the tissues. Edema is an abiotic disorder that does not spread from one plant to another.



Figure 2. Chlorosis and light brown necrosis on the upper side of a geranium leaf.



Figure 3. A large necrotic lesion on a viola leaf.



Figure 5. White blisters on the stem of a tomato transplant.



Figure 4. White blisters on a tomato petiole, which leads curling of leaves.



Figure 6. Edema damage on tomato leaves, petioles, and stems.

## MANAGEMENT

Proper cultural practices to prevent edema in greenhouses include using well-drained growing media, increase light intensity and quality by spacing plants and providing a full-spectrum light, watering plants less during extended periods of cloudy and cool weather conditions, avoiding watering plants in the afternoon or evening, reducing relative humidity by improving ventilation. If possible, growing plant species and varieties that are less susceptible to edema.

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