



Non-infectious plant disorders - Oedema and Intumescences

Introduction

Non-infectious plant disorders where lesions develop on leaves can occur on a number of plant species including begonia, ivy geraniums, cactus, cleome, ivy, ipomoea and annual thunbergia. Broccoli, cabbage, cauliflower and tomato can also suffer from this disorder. Houseplants with fleshy leaves such as jade, peperomia and schefflera may be prone to edema during favorable environmental conditions. These lesions have been called a by a variety of names including intumescences, galls enations, oedema, edema and oedemata. Two of the most common names are oedema, and intumescences.

Symptoms vary and depend upon the plant species, and tenderness of the plant tissue. They may be confused with an infectious disease or insect gall.

Recent research has shown differences between oedema (primarily occurring on ivy geraniums) and intumescences occurring on tomatoes and ornamental sweetpotato vine (*Ipomoea sp.*).

Oedema

This physiological disorder affecting ivy geraniums is thought to be due to a low transpiration rate that can occur when the growing media is warm and wet and the surrounding air is cooler. This results in a build-up of water and solutes in the plant leaves. Blister-like growths develop in the epidermis layer. On ivy geraniums, lesions developed within the leaf mesophyll cells in the middle of the leaf.

Symptoms

Bumps, blisters or water-soaked swellings form on the underside of leaves. These blisters are at first small, about 1 to 2 mm in diameter. They then turn tan or brown and become corky. Severely affected leaves turn yellow and drop from the plant. Sometimes, stems and petioles become infected.

Ivy geraniums with only mild symptoms of oedema often recover. However, some plants may be so severely infected, with significant leaf drop and distorted growth, that they will not be saleable.



Figure 1: Oedema on ivy geranium. Photo by L. Pundt

Oedema is often confused with two-spotted spider mite or thrips feeding damage on ivy geraniums. As spider mites feed on ivy geraniums, the plants develop oedema-like symptoms that often spread to the youngest leaves. Stippling or flecking from spider mite feeding does not occur on ivy geraniums. To distinguish spider mite feeding injury from edema, use a 10 x to 20x hand lens, to look on the underside of leaves for the two-spotted spider mites.



Figure 2: Spider mite injury to ivy geranium continues on younger leaves. Photo by L. Pundt



Figure 3: Spider mite feeding damage to ivy geranium. Photo by T. Smith

Oedema can also be confused with thrips injury. Use a hand lens to look for the small, yellow thrips larvae on the underside of the leaves. As thrips feed upon the ivy geraniums, white scarring and leaf distortion may be noticeable, especially on the youngest leaves.



Figure 4: Yellow thrips larvae and black fecal spots. Photo by L. Pundt

Favorable Conditions

Oedema is thought to be caused by an imbalance of the plant's water uptake and water loss. It develops when the plants roots absorb water at a faster rate than it is transpired through the leaf cells. The enlarged leaf cells divide, and then rupture. This rupturing of the leaf epidermis and inner cells causes the raised blisters commonly seen on the underside of leaves.

In the greenhouse, susceptible varieties of ivy geraniums often develop oedema in the late winter or early spring. This is where the air is most humid with poor air circulation that reduces the plant's transpiration rate.

Recent research at Kansas State University found that high growing medium water contents did not increase the incidence of oedema on four cultivars of ivy geraniums, but just increased overall plant growth. Feeding with supplemental calcium also had no effect on oedema on ivy geraniums.

Selecting less susceptible varieties is probably the best way to manage oedema on ivy geraniums.

Table 1: Susceptibility of Ivy Geranium cultivars to edema		
Most susceptible	Intermediate	Most resistant
Amethyst	Madeline Crozy	Sugar Baby
Yale	Cornell	Double Lilac White
Balcon Princess	Spain	Salmon Queen
King of Balcon	Pascal	Sybil Holmes
Balcon Imperial	Rigi	Galilee
Balcon Royale	Rouletta	
Beauty of Eastbourne		

Table 1. From: White, J. W. (Ed) 1993. Geraniums IV. Ball Publishing. Batavia, IL. 412 pp.

Table 2: Susceptibility of Ivy Geranium cultivars to edema		
Most susceptible	Intermediate	Most resistant
Flare	Nicole	Vinco
Charade	Blanche Roche	Van Gogh
Lambada	Nico	
Baroch	Pico	
Bernardo	Amethyst	

Plants grown in Rutgers University Greenhouses. Grown and evaluated in a glass greenhouse. Table 2 from: Wulster, G. 1996. Minimizing Edema (Oedema) Problems on Ivy Geraniums. Rutgers Cooperative Extension Fact Sheet.

Intumescences

The physiological disorder known as intumescences is characterized by individual epidermal cells swelling on the surface of leaves. There are small bumps or protrusions on the surface of leaves and petioles on ornamental sweetpotato vine, cuphea and tomatoes. Cultivars vary in their response to this disorder.



Figure 5: Intumescences on Cuphea. Photo by L. Pundt

On certain cultivars of *Ipomoea* (sweetpotato vine) white, crusty eruptions resembling grains of salt, develop along the leaf veins. Intumescences do not develop on these crops grown outdoors, but in the greenhouse. Greenhouse poly coverings have a UVB block inhibitor to extend their life. When plants were grown under supplemental UVB radiation, there was reduced incidence of the intumescences.

Growers should consider growing resistant cultivars and avoid growing the very susceptible cultivars. Sweet potato vine cultivars that were especially symptomatic of intumescence development in controlled environments were 'Blackie', 'Black Heart', 'Desana Bronze', 'South of the Border Chipotle', 'Sweet Caroline Bronze', 'Sweet Caroline Sweetheart Red' and 'Tricolor'.

Figure 6: Intumescences on Sweetpotato vine. Photos by L. Pundt



On tomato, older leaves are more affected than younger leaves. Cultivars vary in their responsiveness to this disorder. Lesions developed on the lower surface of the leaves, starting out as large, whitish-green bumps. Lesions then turned brown and collapsed. In some cases, entire leaves collapsed. Bumps, galls or blisters develop on tomato leaves, petioles or stems. Leaf curling, distortion and leaf drop can also occur. Cultivars vary in how susceptible they are, the variety Maxifort, grown for tomato rootstocks, is very susceptible. Due to lack of ultra violet light.



Figure 7: Intumescences on Greenhouse Tomatoes. Photos by L. Pundt

By Leanne Pundt, UConn Extension, Revised June 2011, updated 2019

References:

Carlow, C. 2016. Low Light and High Humidity: Identifying Oedema. On Floriculture Blog: <https://onfloriculture.wordpress.com/2016/11/03/low-light-and-high-humidity-identifying-oedema/>

Craver, J., C. Miller and K. Williams. 2013. Intumescences: A Physiological Disorder of Greenhouse-Grown Crops. Greenhouse Product News <https://gpnmag.com/article/intumescences-physiological-disorder-greenhouse-grown-crops/>

Craver, J.K. C. Miller, M. Cruz and K. Williams. 2014. Intumescences: Further Investigations into an Elusive Physiological Disorder. Greenhouse Product News. <https://gpnmag.com/article/intumescences-further-investigations-elusive-physiological-disorder/>

Moorman, G. W. 2014. Edema of Geranium. PennState Extension Factsheet. <https://extension.psu.edu/edema-of-geranium>

White, J. W. (Ed) 1993. Geraniums IV. Ball Publishing. Batavia, IL 412 pp.

Wulster, G. 1996. Minimizing Edema (Oedema) Problems on Ivy Geraniums. Rutgers Cooperative Extension Fact Sheet. <http://njaes.rutgers.edu/pubs/publication.asp?pid=TFS05>

Wollaeger, H. and E. Runkle. 2014. Does light quality impact the development of edema? MSU Extension https://www.canr.msu.edu/news/does_light_quality_impact_the_development_of_edema

Disclaimer for Fact Sheets:

The information in this document is for educational purposes only. The recommendations contained are based on the best available knowledge at the time of publication. Any reference to commercial products, trade or brand names is for information only, and no endorsement or approval is intended. UConn Extension does not guarantee or warrant the standard of any product referenced or imply approval of the product to the exclusion of others which also may be available. The University of Connecticut, UConn Extension, College of Agriculture, Health and Natural Resources is an equal opportunity program provider and employer.