



Christopher J. Currey
ccurrey@iastate.edu

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Cucumber Hollow Heart

Seedless greenhouse cucumbers (*Cucumis sativus*) are a popular greenhouse crop due to their thin-skinned and seedless fruits with a mild flavor and are virtually ready-to-eat nature. However, have you ever cut open or bit into a fruit only to find it is not fully developed on the inside (Fig. 1)? This disorder is called hollow heart. It is primarily associated with plants in the Cucurbitaceae, or “cucurbits”, including not only cucumbers but melons and summer and fall squashes. Although fruits of other greenhouse and controlled environment crops including tomatoes, peppers, and strawberries may not fully develop, that is usually attributed to incomplete pollination. The cause of cucumber hollow heart is different; it is caused by rapid growth rates. The goal of this e-GRO Edible Alert is to discuss what environmental factors and cultural practices to adjust to reduce excessive growth rates and suppress cucumber hollow heart development.

Temperature

The average daily temperature (ADT) controls the rate of crop growth and development, therefore, reducing growing temperatures to slow down cucumber growth can be used to suppress hollow heart. Compared to other vine crops, cucumbers respond well to warm temperatures, with plants thriving day temperatures between 75 and 80 °F. Reduce the day time air temperature to the mid- to lower-70’s will reduce the ADT and slow down cucumber development. The ADT in a cucumber greenhouse can also be decreased by lowering the night temperature; however, be sure not to achieve this by dropping the night temperature below 65 °F, as cucumber crops are sensitive to cooler temperatures.

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Figure 1. Cucumber hollow heart develops when fruits can't fill during periods of rapid growth. Photo courtesy of Amanda Van Scoy.

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Figure 2. Whether or not cucumbers have hollow heart cannot be determined obviously by simply looking at the fruits; samples must be taken and cut open to identify this disorder.



Figure 3. Unlike other fruiting crop disorder, hollow heart is not the result of insufficient pollination. By lowering air temperature, EC, or nitrogen *Photo courtesy of Amanda Van Scoy.*

Nutrition

Mature cucumber crops can be fertilized with complete nutrient solutions with an electrical conductivity (EC) up to 3.0 mS/cm. However, healthy and productive cucumber plants can be grown with a lower EC, around 2.0 mS/cm. Reducing the EC and growing close to 2.0 mS/cm can reduce excessive growth rates. In addition to the total fertilizer provided to cucumbers (reflected in the EC), watch the amount of nitrogen (N) that is being provided to crops. During the early growth stages of cucumber plant growth, higher proportions of nitrogen may be provided to plants to promote their vegetative growth to get plants sufficiently sized for transplanting, as well as established into systems after transplanting. However, once cucumbers enter their fruiting phase, less N should be provided relative to other nutrients. A good rule of thumb is to maintain a N to potassium (K) ratio of 1:1.5; the elevated K is essential for the developing fruits and the lower N can lead to more manageable growth.

Irrigation

In addition to restricting fertilizers, reduce excessive irrigation to cucumber plants. If the substrate moisture is kept too high too consistently, excessive growth can occur. Monitoring leaching fractions, as well as the substrate moisture, will help identify and manage excess irrigation and allow better wet-dry cycles to occur.

Light

Cucumbers are a high-light greenhouse crop, and their growth increases in response to increasing photosynthetic light. While lowering the light intensity can suppress cucumber growth, this is not an advisable strategy to suppress development of hollow heart in fruits, as reducing carbohydrate production from photosynthesis can reduce yields and post-harvest fruit quality. Instead, focus on temperature, irrigation, and nutrition as environmental and cultural factors that can be manipulated to control cucumber growth and hollow heart.

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CONTRIBUTORS

Dr. Nora Catlin
Floriculture Specialist
Cornell Cooperative Extension
Suffolk County
nora.catlin@cornell.edu

Dr. Chris Currey
Assistant Professor of Floriculture
Iowa State University
ccurrey@iastate.edu

Dr. Ryan Dickson
Greenhouse Horticulture and
Controlled-Environment Agriculture
University of Arkansas
ryand@uark.edu

Nick Flax
Commercial Horticulture Educator
Penn State Extension
nzf123@psu.edu

Thomas Ford
Commercial Horticulture Educator
Penn State Extension
tgf2@psu.edu

Dan Gilrein
Entomology Specialist
Cornell Cooperative Extension
Suffolk County
dog1@cornell.edu

Dr. Joyce Latimer
Floriculture Extension & Research
Virginia Tech
jlatime@vt.edu

Heidi Lindberg
Floriculture Extension Educator
Michigan State University
wolleage@anr.msu.edu

Dr. Roberto Lopez
Floriculture Extension & Research
Michigan State University
rglopez@msu.edu

Dr. Neil Mattson
Greenhouse Research & Extension
Cornell University
neil.mattson@cornell.edu

Dr. W. Garrett Owen
Floriculture Outreach Specialist
Michigan State University
wgowen@msu.edu

Dr. Rosa E. Raudales
Greenhouse Extension Specialist
University of Connecticut
rosa.raudales@uconn.edu

Dr. Beth Scheckelhoff
Extension Educator - Greenhouse Systems
The Ohio State University
scheckelhoff.11@osu.edu

Dr. Ariana Torres-Bravo
Horticulture/ Ag. Economics
Purdue University
torres2@purdue.edu

Dr. Brian Whipker
Floriculture Extension & Research
NC State University
bwhipker@ncsu.edu

Dr. Jean Williams-Woodward
Ornamental Extension Plant Pathologist
University of Georgia
jwoodwar@uga.edu

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