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Chilling Injury Symptomology of Greenhouse Cucumbers

Cucumbers are cold sensitive and chilling injury can occur if air temperature drops below 65 °F. Chilling injury of cucumber include upward leaf rolling, browning, bleaching (whitening) of the leaf veins, and necrosis (death); fruit chlorosis, curling, and skin splits; and stem splitting.

During late fall to early spring, greenhouse growers may find themselves struggling to manage the greenhouse environment because of outdoor winter weather conditions. Greenhouse air, root-zone, and plant temperatures are important to manage and maintain because they influence plant development. If the greenhouse temperature cannot be maintained and falls below the species-specific optimum temperature, plant development declines and flowering or fruit set can be delayed. At some species-specific temperature, development will stop and is referred to as the base temperature. When crops are exposed to extreme temperatures or fluctuations, chilling and freeze injury can occur, thus diminishing crop and fruit quality. This e-GRO Alert will focus on chilling injury symptomology of greenhouse-grown English and mini cucumber segments.

A few weeks ago, the eastern United States experienced a series of ice and winter storms, and their effects were noted on cucumber plants during a recent greenhouse visit. Greenhouse cucumbers are cold sensitive and susceptible to chilling injury. Their base temperature is around 60 to 65 °F (15 to 18 °C) and chilling injury can occur at the base temperature or from 45 to 65 °F (7 to 18 °C). Various stages of chilling injury symptoms were observed among English and mini cucumber transplants and fruiting high-wire crops exposed to several days of 55 °F (13 °C). Chilling injury symptoms of cucumber leaves included upward leaf curling and rolling (Fig. 1), browning (Fig. 2), and bleaching (whitening) of the leaf veins (Fig. 3). Longitudinal stem splitting (Fig. 4) of the primary leader was noted and increased with severity. Single to multiple small splits first develop among the internodes of the primary leader (Fig. 5).

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In some instances, advanced symptoms expanded the whole length of the internode measuring 4 to 8 inches (10 to 20-cm; Fig. 6). In young, developing fruits, abortion and desiccation was observed (Fig. 7). In developed fruits, curling (Fig. 8) and brown fruit skin surface splits (Fig. 9) was documented. In severe instances, chlorosis (Fig. 10) and bleaching (Fig. 11) of the cucumber fruit skin was noted with these blemishes making them unmarketable.

Overall, there are no corrective actions for chilling injury. Depending on the severity, removing injured or necrotic foliage or fruits will be beneficial in preventing secondary infections. Plants that recover will exhibit delayed flowering and fruit set. There is no cure for stem splitting or fruit injury. Growers should maintain the air temperature between the general range of 68 to 74 °F (20 to 23 °C). Note, optimal temperatures for greenhouse cucumbers should be adjusted for the crop growth stage: propagation, transplant production, and the vegetative and fruiting stages.

Growers are encouraged to inspect or perform routine maintenance prior to winter weather to safeguard their crops. Greenhouse heaters should be inspected to ensure proper heating and venting and that optimal growing temperatures can be achieved. Any damage to the greenhouse-glazing material should be repaired. Plastic barriers at greenhouse entrances or exhaust fans (Fig. 12) can be installed to provide protection from cold air entry and prevent injury. Overall, the best method to prevent cold damage in cucumbers is proper planning, greenhouse maintenance, and management of the greenhouse environment.



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Figure 1. Chilling injury in greenhouse cucumber can cause upward leaf curling. This cucumber transplant was exposed to 46 °F (8 °C) for 16-hours. Photo by W. Garrett Owen.



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Figure 2. Chilling injury in greenhouse cucumber can cause browning of the young and recently matured leaves. This cucumber transplant was exposed to 46 °F (8 °C) for 16-hours. Photo by W. Garrett Owen.



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Figure 3. Chilling injury in greenhouse cucumber can cause bleaching (whitening) of the leaf veins. This cucumber transplant was exposed to 46 °F (8 °C) for 16-hours. Photo by W. Garrett Owen.



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Figure 4. Longitudinal stem splitting was observed as a symptom of chilling injury of greenhouse-grown cucumbers. Photo by W. Garrett Owen.



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Figure 6. In severe instances, longitudinal stem splitting occurred along whole length of the internode measuring 4 to 8 inches (10 to 20-cm). Photo by W. Garrett Owen.



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Figure 5. Among internodes, single to multiple small splits developed on the primary leader because of chilling injury in greenhouse-grown cucumbers. Photo by W. Garrett Owen.



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Figure 7. Chilling injury in greenhouse cucumber can cause young, developing fruits to abort and desiccate. Photo by W. Garrett Owen.



Figure 8. Chilling injury in greenhouse cucumber can cause developed fruits to curl. Photo by W. Garrett Owen.



Figure 9. Chilling injury in greenhouse cucumber can cause the skin of developed fruits to exhibit brown surface splits. Photo by W. Garrett Owen.

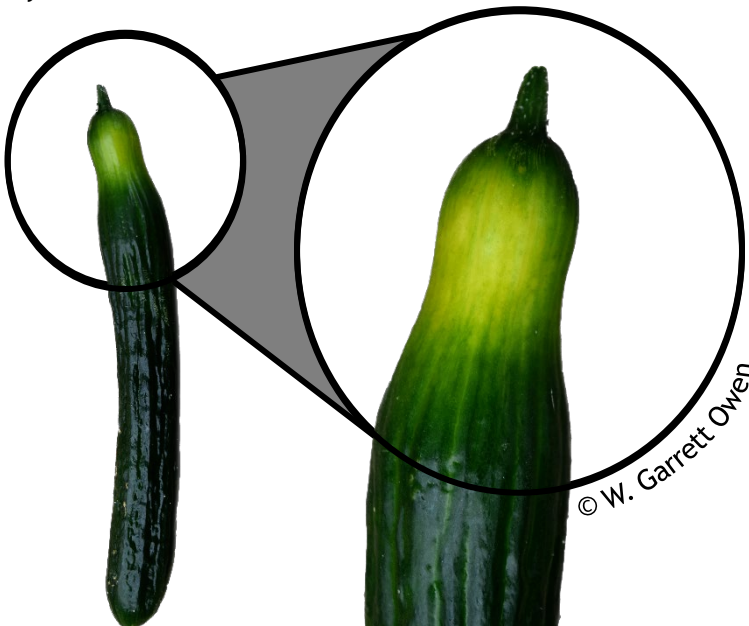


Figure 10. In severe instances of chilling injury, greenhouse cucumber fruit may exhibit chlorotic blotches. Photo by W. Garrett Owen.



Figure 11. Advance symptoms of chilling injury of greenhouse cucumber fruit include bleaching. Photo by W. Garrett Owen.



Figure 12. Plastic barriers can be temporarily installed to provide protection from cold air entry and prevent injury. Photo by W. Garrett Owen.

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