Watch Out for Ozone Damage

By Dawn Pettinelli, UConn Home & Garden Education Center

As if insects, diseases, and wildlife weren't enough to worry about with our vegetable plants, another concern during hot, humid summer weather is the potential for ozone damage. Ozone is a highly reactive gas composed of three oxygen atoms. It forms both naturally and because of human activities.

There are two layers of ozone in our atmosphere; one is beneficial, the other is harmful. The beneficial is naturally occurring ozone in the stratosphere which is about 10 to 31 miles above the earth. This layer protects all life on earth from harmful ultraviolet radiation. Without this layer, it would be extremely difficult for plant or animal life to survive. Older readers might remember the dire warnings about the hole in the ozone layer discovered in the 1970s being caused by man-made chemicals and how an international agreement (Montreal Protocol) was launched to reduce the use of these chemicals. The hole is getting smaller, but it will take decades longer for it to close completely.

Surface level ozone is created when pollutants from the combustion of fossil fuels, like nitrogen oxides and volatile organic compounds, combine with oxygen in the presence of sunlight. This forms a very common air pollutant in the eastern United States that is easily moved from areas of high concentration like cities and heavily traveled roads to backyards and fields. Ozone damage is most likely to occur during hot, sunny periods with minimal air movement.

Most of us are familiar with the fact that when plants photosynthesize they absorb carbon dioxide from the atmosphere and in the presence of water and sunlight, it is converted into carbohydrates that provide the plant with the ability to grow and develop. Carbon dioxide enters the plant through very small pores in the bottom of the leaves, called stomata. Plants can open or close their stomata depending on environmental conditions and their photosynthetic needs.

When the stomata are open, other gases in the atmosphere can enter as well as carbon dioxide. If ozone is present, it will get absorbed along with the carbon dioxide. Just as ground level ozone is hazardous to human health, it adversely affects susceptible plants by oxidizing (basically burning) plant tissues during plant respiration.

Symptoms of ozone damage are quite noticeable on several vegetables, but it can affect ornamentals and native ecosystems as well. A very common symptom of ozone damage to vegetable plants shows up as small, irregularly shaped dark brown, black, tan or white spots on upper leaves. Vegetable plants that are most susceptible to ozone damage include cucumbers, squash, pumpkins, potatoes, snap beans, and melons. Some cultivars or varieties show more damage than others so note this and plant ones that show least signs of damage in future years.

Ozone damage on cucumber. Photo by Shuresh Ghimire, UConn

According to UConn Vegetable Extension Specialist, Dr. Shuresh Ghimire, ozone damage to susceptible plants usually occurs when ozone levels are over 80 ppb (parts per billion) for 4 or 5 consecutive hours or over 70 ppb for a day or two during critical vegetable growth periods. Anyone can find out information about the air quality in their location by going to www.airnow.gov and putting in their zip code.

In natural ecosystems, ozone can affect sensitive plants in forests, parks, and wilderness areas, especially during the growing season. Some especially sensitive plants include black cherry, white pine, red alder, quaking aspens, and tulip poplars. Since high levels of ozone reduce a plant's photosynthetic capacity, a plant's growth is reduced. Also, these affected plants are more susceptible to diseases, insects, environmental stresses, and other pollutants that are encountered. Ultimately this can result is loss of species diversity that can change habitat quality as well as water and nutrient cycles. As with climate change, the only way to reduce problems with ozone is to reduce the use of fossil fuels.

If you suspect your plants may have ozone damage or for questions on other gardening topics, feel free to contact us, toll-free, at the UConn Home & Garden Education Center at (877) 486-6271, visit our website at www.ladybug.uconn.edu or contact your local Cooperative Extension center.