

# Horticulture in Times of Climate Change

**Nadilia Gomez and Neil O. Anderson, Flower Breeding & Genetics  
Department of Horticultural Science, University of Minnesota**

At this year's meeting of the American Society of Horticultural Science, a special topic was highlighted with its own one-day symposium. Climatologists, plant scientists and extension specialists gathered to discuss the future of horticulture in a time of change, more specifically, a time of **climate** change.

The symposium started by providing evidence supporting climate change. There is still some debate whether the increase in temperature recorded in the last decades is a sign of hotter days to come, or whether it is part of the normal fluctuation of hot and cold cycles the Earth has experienced throughout its lifetime. Most of the arguments against climate change focus on the accuracy of models to predict the change in temperature. The panel of experts explained that none of the models describe the final outcome of climate change perfectly because a completely accurate model would need to include numerous factors. The model would need to consider the effect of elements such as the position of large bodies of water, vegetation, mountain ranges, ocean currents and other factors that affect local climate. Nonetheless, whether the debate focuses on questions regarding the cause of the change or the precision of the models, an increase in global temperature and a change in climate have been documented for several decades.

The first sessions at the meeting were incredibly interesting, but they were surpassed by the discussions that followed. After clearly explaining climate change, the speakers directed the audience's attention to the issues that are of most relevance to us. What effect does climate change have for horticulture?

Standards for crop production may change in response to temperature changes during the growing season. Tomato production and citrus crop fruit size will decrease with elevated temperature. In Minnesota, climate change could mean warmer winters, earlier springs, and longer frost-free falls, resulting in earlier emergence of spring flowers and longer blooming periods for perennials.

Greenhouse gases that cause increase in global temperatures can directly impact the prevalence of weeds. Ragweed (*Ambrosia artemisiifolia*), the leading cause of human allergies, can increase in size dramatically when grown in elevated carbon dioxide environments. Canada thistle (*Cirsium arvense*), a noxious weed, also doubles its size. Moreover, our current practices to control these weeds may lose efficacy. Round-Up, for example, may be less effective in controlling the spread of Canada thistle because under elevated carbon dioxide levels most of the growth occurs in the underground rhizomes that remain protected from spot treatments with the herbicide.

It is also expected that the life cycle of insects, including crop pests, may be altered. Temperature plays an important role in determining the growth of many insects. Elevated temperatures may cause more generations of insects per growing season. The consequence is expected to be higher pathogen and herbivore pressures on crop plants.

The concluding remarks left us all with a renewed appreciation for the vulnerability and adaptability of the horticultural industry. Unlike in agronomy, where there are a few crops that are produced on a major scale, the horticulture trade is incredibly diverse. For agriculture to adjust to climate change, one cereal-

grain crop can be studied in detail and conclusions may be extrapolated to make decisions regarding other similar crops. For horticulture, on the other hand, the effect of climate change will vary dramatically from one crop to another, making it difficult to keep growers one step ahead in the midst of change. Perennial crop production may be the most difficult to adjust because adverse conditions in a single year may reduce production in subsequent years.

In the midst of uncertainty, nonetheless, we must think about the future. A shift in the regions of production of certain crops may be expected. Marginally cold tolerant crops may make their debut as new perennials for Minnesota. Incorporating these plants into our landscape will be accompanied by new challenges in terms of growing requirements and weed control. Our success to adapt to changing times will partly depend on efforts we have already started to work on. For years, plant breeders have been working on drought, heat and pest tolerant cultivars in a wide variety of crops. Research is now focusing on the study of weedy species and the potential invasiveness of new ornamental crops. A better understanding in the areas of plant response to stress and invasive biology will prove beneficial.

The diversity encompassed by the horticulture industry may provide the genetic basis to adapt to changing times. Keep in mind that the ability of the horticulture industry to change constantly in the pace of consumer demand has lent it a level of flexibility that can be beneficial. Unlike agronomy, we are able to introduce new cultivars with relative

*Continued on page 7*