

Supporting Fruit and Vegetable Farming in a Changing Climate

Dealing with volatile weather is nothing new for farmers. A dry spring may be followed by a wet summer, only for the opposite to be true the following year. Farmers are well practiced at shifting strategies in response to swings in weather.

In recent years, shifting climate patterns have subjected crops to intensifying weather events, and, in some cases, lasting ecosystem changes. Delicate fruit and vegetable crops are particularly vulnerable to changes in weather and climate, with some only flourishing in specific temperature and moisture conditions. Despite these challenges, farmers continue to bring in more and better produce harvests, using fewer resources and with less of an impact on the environment.

For fruit and vegetable farmers to remain resilient and productively sustainable, they need access to every tool available. These include planting resistant varieties and hybrids, revising management practices and using products that protect crops and improve their ability to recover and keep yielding in tough conditions. Mitigating effects of extreme weather is where biological products are especially useful.

Mitigating weather-related abiotic stress

Traditionally, crop protection products are designed to combat living (biotic) threats, such as insect pests, diseases, nematodes and weeds. Changing weather conditions influence these threats – wet weather might make fungal diseases more severe, for example. But extreme weather also introduces other, non-living (abiotic) stressors, such as overly dry soils or ones with high salinity. “Abiotic stress was traditionally overlooked from a crop management standpoint,” says Francisco Javier García Domínguez, Biologicals Global Product Manager, Integrated Solutions, Corteva Agriscience. However, this is an area where today there are more tools to reduce climate effects and improve performance.

Abiotic stress can negatively impact the viability of fruit and vegetable plants, resulting in lower crop yields and nutritional content. Plants may have multiple responses to various abiotic stress factors when adverse conditions deteriorate the plant’s growth and developmental patterns.¹ The signs might not always be as obvious as withered leaves. Subtle – even invisible – symptoms, such as decreased nutrient uptake, smaller-diameter stems or fewer blossoms, may significantly affect plant performance.

Biologicals can offer a solution for the challenges abiotic stress can create for farmers and their productivity. Biological products are made from living organisms or derived from naturally occurring materials without being synthetically modified. Examples include enzymes and helpful bacteria.



Some biologicals – categorized as biostimulants – work by triggering health processes in plants to help them perform natural activities more efficiently. Just as animals have physiological responses such as sweating when it’s too hot, plants also have mechanisms that help them manage stress. Some biostimulants work on those stress responses so that plants can be more resilient under abiotic stresses, such as soil salinity, UV radiation, water stress or extreme temperatures. “Today, we have a better understanding of plant physiological processes and are able to identify biomolecules or microbials that answer some of the challenges we face,” Domínguez says. “We can offer effective, sustainable solutions that help maximize yield potential in a quantitative and qualitative way, increasing profitability for growers.”

For example, a biostimulant could be applied a few days in advance of an anticipated event such as extreme high temperatures, helping the plant get through the stressful period. Some of the stresses biostimulants can help with include:

- Water deficiency
- Excess water/flooding
- Excessive heat
- Extreme cold
- Light deficiency during critical growth stages
- Recovery from phytotoxicity due to specific adverse growing conditions

Even absent abiotic stresses, biostimulants can be generally helpful in maximizing plant health and vigor. These biologicals can improve factors like reproduction, growth and multiple quality considerations that directly impact fruit and vegetable marketability. A recent study reports an increase of 17.9% in yield from using biostimulants on fruits, vegetables and other crops.²

Because biologicals are made from naturally occurring substances, these gains also often come with a favorable environmental profile, including minimizing impact on the

ecosystem and reducing farm inputs. "Some biostimulants play a pivotal role in lowering agriculture's carbon footprint," notes Pablo Riveros, Field Scientist and Principal Biologist in Specialty Crops at Corteva Agriscience. "For example, certain biofertilizers can catch nitrogen from the atmosphere and make it available to the plant." Similarly, products that improve water-use efficiency can help with efficient use of natural resources.

Addressing biotic stressors influenced by climate

Shifts in weather patterns can also change biotic stressors. "When the conditions of an agrosystem change, new and emerging insects or pathogens can occupy the new environment and change the population dynamics," Domínguez says.

Some pests thrive with higher temperatures and precipitation levels, and they travel accordingly. Since 1960, damaging crop insects and diseases have traveled at an average of 3 kilometers per year in the direction of earth's north and south poles as temperatures increase.³ Fall armyworm, for example, has spread more rapidly due to the expansion of warmer climates.⁴ Cooler and wetter conditions may be more hospitable to the spread and severity of fungal diseases, while warmer winters let pests survive over the winter in the soil.

Biologicals are a good complement to conventional crop protection solutions when crops face both biotic and abiotic challenges. For example, in fruits and vegetables, if adverse weather conditions lead to biotic stressors later in the season, use of a biocontrol product with a conventional insecticide or fungicide may be useful.

With biologicals contributing to naturally healthier and more vigorous plants, conventional treatments may not need to be as frequent. For example, using a stress-mitigating biostimulant early in the season followed by a conventional fungicide application enhances disease protection. Used in this way, biologicals don't replace conventional products, but can supplement efficacy.

Remaining resilient and productive

As more extreme weather events impact the growing season, the more fruit and vegetable farmers need innovative tools to meet the needs of the food chain and consumers. Biologicals provide promising tools for farmers to mitigate crop stress and maximize environmental inputs. Used alongside conventional crop protection solutions, biologicals can make plant health and productivity a little more predictable in a world where conditions certainly are not.

¹ Dey, Shubham, and Raichaudhuri, Ayan. "Abiotic Stress in Plants." IntechOpen. <https://www.intechopen.com/chapters/82937>.

² Li, Jing, Van Gerrewey, Thijs, and Geelen, Danny. "A Meta-Analysis of Biostimulant Yield Effectiveness in Field Trials." National Library of Medicine. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9047501/>.

³ Doody, Alison. "Pests and diseases and climate change: Is there a connection?" CIMMYT. <https://www.cimmyt.org/news/pests-and-diseases-and-climate-change-is-there-a-connection/>.

⁴ "Scientific Review of the Impact of Climate Change on Plant Pests." Food and Agriculture Organization of the United Nations. <chrome-extension://efaidnbmnnnibpcajpcgclefindmkaj/https://www.fao.org/3/cb4769en/cb4769en.pdf>.