



FOR IMMEDIATE RELEASE

New Study Reveals Vulnerability of Coffee Quality to Environmental Shifts and Management Practices

November 1, 2021 — A team from Montana State University (MSU), Tufts University, and the Specialty Coffee Association (SCA) has published a study finding that coffee quality is sensitive to shifts in environmental factors linked to climate change as well as to shifts in climate adaptation strategies.

The paper, *Climate Change and Coffee Quality: Systematic Review on the Effects of Environmental and Management Variation on Secondary Metabolites and Sensory Attributes of Coffea arabica and Coffea canephora*, was published this month in the journal *Frontiers in Plant Science*.

Past research has focused on how climate change impacts crop yields, according to Dr. Selena Ahmed, Associate Professor in MSU's Department of Health and Human Development, and one of the paper's lead authors. But recent studies have begun to look at how climate change impacts crop quality based on its biochemical composition, which influences the flavor of coffee, as well as its nutritional and health attributes.

"All of the biochemical compounds in coffee beans are critical to coffee quality," she said. "Shifts in the biochemical composition of coffee loop back into the food system as it impacts the way consumers' experience the flavor of coffee and their decisions about purchasing coffee. In turn, consumer decision-making impacts farmers' livelihoods as well as how they manage their farms, with tremendous implications for sustainability."

The research team included co-authors from MSU, Tufts, the SCA and its research arm the Coffee Science Foundation, and Bozeman-based Treeline Coffee. They include Sarah Brinkley, Erin Smith, Ariella Sela, Mitchell Theisen, Cyrena Thibodeau, Teresa Warne, Evan Anderson, Natalie Van Dusen, Peter Giuliano, Kim Elena Ionescu and Sean B. Cash. Students – including graduate students in MSU's sustainable food systems program, the Friedman School of Nutrition Science and Policy at Tufts University and Texas A & M University – participated in the research.

For their study, the researchers screened approximately 1,600 peer-reviewed scientific papers published between 2000 and 2018. From those papers, they identified 73 that addressed the study's research questions to include in their review.

The team found two clear trends, according to Sarah Brinkley, a graduate student at Texas A&M University and co-author: Increased altitude is associated with improved flavor and aroma of coffee, and increased light exposure is associated with decreased sensory attributes of coffee. They also found, in general, that coffee quality is vulnerable to changes in water stress, temperature, levels of carbon dioxide in the air, and nutrient management.

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"For years, coffee farmers have told buyers that the climate is changing and complicating their work, but the impacts of those changes on coffee flavor have been based on anecdotal evidence and, sometimes, on speculation," said Kim Elena Ionescu, Chief Sustainability and Knowledge Development Officer at the SCA.

Erin Smith, an alumna of MSU's sustainable food systems graduate program and paper co-author, said more research is needed in these areas to learn about the effects of shifts in carbon dioxide, water stress, and temperature on coffee quality, as well as how those shifts vary with location, elevation and management conditions.

The team also found that climate adaptation strategies on farms around the world, such as managing light exposure by maintaining canopy coverage and through on-farm diversification, are promising for maintaining or improving coffee quality, Ahmed said. In turn, evidence-based strategies could also help farmers sustain their livelihoods.

"A better understanding of the relationship between climate and coffee quality is overdue and will be essential for the specialty coffee industry to adapt to the challenges we are facing and to thrive in the future," said Peter Giuliano, executive director of the Coffee Science Foundation.

Ultimately, it's important to understand how climate affects all crops so that changes in climate can be managed to support food security, nutrition and farmer livelihoods, Ahmed said.

"This is important to study for all food and beverages, not just for coffee. By understanding and managing the biochemical composition of crops along with other attributes of sustainability, we can better support the food system to be resilient to disruptions."

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Note to Editors

- Read the full article at [MSU News](#).

About the Specialty Coffee Association

The SCA is a trade association built on foundations of openness, inclusivity, and the power of shared knowledge. The SCA's purpose is to foster global coffee communities to support activities to make coffee a more sustainable, equitable and thriving activity for the whole value chain. From coffee farmers to baristas and roasters, our membership spans the globe, encompassing every element of the coffee value chain. The SCA acts as a unifying force within the specialty coffee industry and works to make coffee better by raising standards worldwide through a collaborative and progressive approach. Dedicated to building an industry that is fair, sustainable, and nurturing for all, the SCA draws on years of insights and inspiration from the specialty coffee community. Learn more at sca.coffee.

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