

★ Sustainable Cranberry Production FY 25

Project: Sustainable Cranberry Production

University of Massachusetts

APPROVED as of 04/02/2026

Project Director

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Primary Critical Issue

Sustainable Agriculture and Food Systems

Fiscal Year

2025

Project Start & End Date

10/01/2020

Organization

University of Massachusetts

Organization Project Number

Accession Number

7002085

Funding Source

Extension Capacity Fund (Smith-Lever 3(b) and 3(c))

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Warmer temperatures have affected the phenology of most plants, but limited information exists for the American cranberry. We examined long-term spatiotemporal trends in spring development of cranberry buds using field observations of cranberry bud stages over a 65-yr period from 1958.

Understanding shifts in cranberry phenology is crucial for comprehending the subsequent impacts on management and crop productivity.

Specific objectives were to evaluate:

- 1) long-term annual trends in the occurrence of three cranberry phenological stages using detailed local records from 1958 to date,
- 2) spatiotemporal patterns in the cabbage head stage across southeastern Massachusetts using a growing degree day (GDD)-based model from 1958 to 2022, and

3) analyze air temperature and GDD as the primary variables controlling trends in the phenological stages of cranberry.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Temperature shifts are affecting life cycle of various plant species. With rising air temperatures, most plants are developing faster in the recent years as compared to many decades ago. This study looked at the changing rate of cranberry growth in the spring due to rising air temperatures from 1958-to date. The cranberry growth stages were observed in the field each year and trends were evaluated on the timing of these growth stages. We found that the cranberry plants were developing earlier by about 20 days in the spring from 1958-2022. The primary factor causing the accelerated growth was rise in air temperatures over the study period. Similar trends were found for all cranberry farms in Massachusetts. As a result, the frost protection in cranberries will need to be adjusted according to the changing rate of cranberry growth. Similar adjustments in cultural practices will be required for optimal growth of cranberries.

Briefly describe how your target audience benefited from your project's activities.

Through Bogside meetings and other Extension meetings, cranberry growers and handlers were apprised on the effect of rising air temperatures and its subsequent effects on cranberry bud phenology. In turn this affects spring frost management, fruit yield, quality, and rot. Growers have a better understanding of monitoring for spring frost in cranberry and in using the growing degree day models (GDD) to inform them when to start monitoring for spring frost. A 65-year-old practice traditionally used to start frost protecting is no longer accurate due to shifts in cranberry phenology. Cranberry cultivars now tend to develop a lot earlier by at least 14 days compared to 65 years ago according to our findings. These results help to sustain the cranberry industry since a single unmanaged frost event can destroy an entire season's harvest in a matter of few hours.

Briefly describe how the broader public benefited from your project's activities.

Our activities support the Mission of the Cranberry Station, the Center for Agriculture, Food and the Environment, and the Land Grant mission by maintaining and enhancing the economic viability of the Massachusetts Cranberry Industry through research and outreach and serving the public welfare by supporting economic development and the protection of the environment. Fostering the economic and environmental health of the cranberry industry has positive repercussions in the southeastern region of the Commonwealth and beyond.

Comments (optional)

A Postdoctoral fellow was included in the project, providing a training opportunity. Outcomes of this project were presented to growers at bogside, extension meetings and annual winter crop production meeting. A partial data set of this project was presented at the X ISHS on Vaccinium

Symposium in Nova Scotia 8/24/2024, and in a peer reviewed referred journal in International Journal of Meteorology listed below.

1. Sandeep Bhatti, Peter Jeranyama, Casey Kennedy, Anthony Buda, David Miller and Carolyn DeMoranville. 2024. Frost Forecasting in Cranberry in Massachusetts. XIII International Symposium on Vaccinium, 8/24/2024 Nova Scotia. ISHS.
2. Bhatti, Peter Jeranyama, Casey Kennedy, Carolyn DeMoranville, Anthony Buda, David Millar, Katherine Ghantous. 2025. Changes in cranberry phenology from 1958 to 2022: Implications for spring frost protection in Massachusetts, United States. International Journal of Meteorology <https://doi.org/10.1007/s00484-025-02892-w>