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Penn State secures $828,700 for research into winery quality problems

The 11 grants back studies of sulfur off-odors, oxidation, vineyard nutrition, production costs and wine marketing

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Penn State’s College of Agricultural Sciences has received more than $825,000 in grants for research on grape growing and winemaking, backing a set of projects aimed at some of the most common problems wineries face, including sulfur-related off-odors,

oxidation, shelf life and production costs.

The university announced the awards on Monday, November 16. The funding comes through the Pennsylvania Liquor Control Board and the Pennsylvania Department of Agriculture’s Wine Marketing and Research Board. Penn State listed 11 grants tied to grape and wine research, with a combined value of about $828,700.

The projects are meant to support Pennsylvania’s wine industry at several points in the production chain, from vineyard nutrition and grape yields to fermentation, bottling, storage and marketing. According to the Pennsylvania Department of Agriculture, the state’s 400 licensed wineries generate $747 million in tourism revenue each year. The department says the industry supports 10,756 jobs, pays $518.2 million in wages and contributes $1.77 billion directly to Pennsylvania’s economy annually.

Beth Gugino, associate dean for research operations and graduate education in the college and associate director of the Pennsylvania Agricultural Experiment Station, said the grants reflect work across viticulture, enology, food science, plant nutrition, agricultural economics, horticultural marketing and consumer behavior. She said Penn State is trying to address challenges that range from pests and diseases in vineyards to wine quality and business competitiveness.

A large share of the funding will go to studies of sulfur-related wine faults, a persistent issue for wineries because undesirable sulfur compounds can create rotten egg or other off-aromas that may appear during production or even after bottling. Ryan Elias, a professor and associate head of food science, and Misha Kwasniewski, an associate professor in food phytochemistry and fermented foods and director of the Lake Erie Regional Grape Research and Extension Center, received a $70,849 grant for work on new ways to reduce hydrogen sulfide formation in Pennsylvania wines without relying on copper sulfate treatments.

The same two researchers also received a $74,061 grant to pilot a diagnostic test that would help wineries identify wines at risk of developing sulfur-related off-aromas after bottling. Elias separately received $71,999 to continue developing a test to detect latent chemical precursors that may lead to unwanted sulfur odors later, with the goal of helping winemakers spot quality problems before bottles reach the market.

Another major area of research focuses on oxygen exposure during winemaking. Too much oxygen at the wrong stage can speed up oxidation, shorten shelf life and reduce product stability. Kwasniewski and Molly Kelly, an enology extension educator, received $43,472 to measure oxygen pickup throughout winemaking operations, from harvest through bottling, and identify points where exposure can be reduced. Kwasniewski, Elias and Kelly also received $84,811 for a related study on how equipment and storage practices common in Pennsylvania wineries affect oxygen exposure and wine quality.

For wine producers and the broader beverage business, those questions are commercially important because oxidation, off-aromas, preservation and process costs are routine quality-control issues. Although the Penn State grants are focused on wine, some of the findings could have wider value wherever producers are trying to maintain flavor consistency and product stability during processing and packaging.

Penn State also received funding for a project that looks at lower-cost ways to shape a wine’s flavor and aging profile. Kwasniewski, Elias and Helene Hopfer, an associate professor of food science, were awarded $97,860 for a study on integrating chemical aging into traditional production, including the effects of acetaldehyde addition before and after primary and malolactic fermentation. The university said the work is intended to test a less expensive alternative to barrel aging and other oxygenation methods.

Several grants are aimed at conditions in the vineyard rather than the cellar. Cain Hickey, an assistant teaching professor of viticulture, Michela Centinari, a professor of viticulture, Kwasniewski and research technologist Donald Smith received $96,846 to continue a multiyear study of grapevine nutrient levels across Pennsylvania vineyards. A second grant of $80,922 to Hickey, Centinari and Kwasniewski will support related field research on how nutrient levels affect vine growth, fruit quality and yields. The goal is to build more accurate local nutrient recommendations for growers.

The cost side of grape growing is also part of the package. Claudia Schmidt, an associate professor of marketing and local and regional food systems, Hickey, business management extension educator Andrew Holden and extension program specialist Paula Ledney received $38,919 for a cost-of-production study covering vinifera, hybrid and Concord grapes. Penn State said the work is intended to help growers build

production budgets, manage costs and improve profitability.

Consumer demand is another focus. Kathleen Kelley, a professor of horticultural marketing and business development, and Schmidt received $78,973 for a study of wine buyers and marketing strategies in the Mid-Atlantic region. The research will examine purchasing behavior, barriers to consumption and possible ways to better promote Pennsylvania wines.

The final grant announced by the university targets another issue that has become more important for many producers: whether biological methods can reduce dependence on added sulfites. Josephine Wee, an associate professor of food science, and Kelly received $89,993 for a study on using the wine grape microbiome to manage dissolved oxygen and sulfur dioxide levels in finished wines. Penn State said the project will explore whether those biological approaches can help limit spoilage while maintaining wine quality.