Ensuring nutritious and high-quality potatoes are available during the winter season and all year round

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Scientists at the USDA's Agricultural Research Service (ARS) use innovative technology to study the lifecycle of potatoes (including

development, production, and postharvest storage), ensuring a high-quality supply year-round for snack food processing facilities, restaurants, and grocery stores.

Potatoes are one of the main crops grown in the U.S., producing approximately 22.5 million tons annually. Fall is the primary season for harvesting potatoes, accounting for 90 percent of the total production. Since many locations cannot support year-round potato cultivation, most potatoes intended for processing, such as frozen french fries or instant mashed potatoes, are harvested in the fall and safely stored until needed.

Storing and maintaining potatoes at their top nutritional quality while meeting consumer and market demands is essential for the industry.

Yet, potato producers face several critical challenges, including climate- and disease-related challenges during crop production and long-term storage. Maintenance of post-harvest quality is of prime concern to the potato industry because post-harvest crop losses through physiological and disease-related processes routinely reach 10–15 percent. These challenges include factors such as early sprouting and slow wound healing of potato tubers inadvertently damaged during the operational process.

Have you opened your home pantry and found potatoes sprouting? Immediately after harvest and for an indeterminate period, potato tubers are physiologically dormant and will not sprout even when placed in growth-promoting conditions. The length of the tuber dormancy period is determined by the genetics of the potato cultivar and environmental conditions during crop production and post-harvest storage –including temperature, humidity, light, and air composition.

Premature sprouting or incomplete wound-healing adversely affects potato processing quality and nutritional value, resulting in lower

producer prices or even complete market rejection by the industry and fresh market.

Munevver Dogramaci, a research plant physiologist and lead scientist of the Potato Research Program at the Edward T. Schafer Agricultural Research Center in Fargo, North Dakota, and Darrin Haagenson, a research plant physiologist at the Potato Research Worksite in East Grand Forks, Minnesota, collaborate with growers and universities to address these post-harvest physiological challenges, as well as to evaluate advanced potato breeding material for postharvest storage, food quality, and safety characteristics.

"Currently, there is no method that is 100 percent efficient to control the physical deterioration of the potato tubers during storage," said Dogramaci. "Potato tubers are at their peak nutritional quality during harvest, but it is essential to store them under specific conditions to maintain this quality."

A better understanding of physiological processes will help scientists improve post-harvest storage methods, preserving nutritional value, processing quality, and the marketability of potatoes.

Dogramaci also noted that unintended wounding of tubers, like cuts and bruises, can also occur during harvest and post-harvest operations. "This results in rapid quality loss that impacts the tuber's texture, ability to retain water, and an increase in its susceptibility to diseases during storage," Dogramaci explained.

Paul J. Collins, a research geneticist for the ARS Eastern potato breeding program based in Orono and Presque Isle, Maine, is working to develop new varieties for chip processing and table markets with improved agronomic attributes, disease resistance, climate resiliency, and quality traits. Successful varieties developed by this program include Atlantic, a

variety that is widely grown across the U.S. for potato chips and is within the top ten most popular potato varieties grown in the nation.

"Potato breeding seeks to identify new potato varieties that can provide benefits throughout the value chain," said Collins.

"Farmers can benefit from disease resistance traits, resilience to climate variability, and improved yields. Processors and retailers are interested in maintaining quality and uniformity. Consumers are driven by improved nutrition and flavor. The breeding program shows huge variability for all of these traits. The challenge and fun of potato breeding is finding a new variety which makes everyone in the value chain happy."

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