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From landfill to lipstick: Grape waste as a cosmetic and food ingredient

AMERICAN CHEMICAL SOCIETY

NEW ORLEANS, March 19, 2018 -- The world drinks a lot of wine, and that means a lot of grapes are consumed every year. But not every part of the grape ends up in the bottle. Seeds, stalks and skins -- roughly a quarter of the grapes --- are typically discarded in landfills as waste. But now, researchers say they have found some useful commercial applications, such as prolonging the shelf life of fatty foods, for these wine leftovers.

The researchers present their work today at the 255th National Meeting & Exposition of the American Chemical Society (ACS). ACS, the world's largest scientific society, is holding the meeting here through Thursday. It features more than 13,000 presentations on a wide range of science topics.

"Large amounts of grape waste may be detrimental to the environment," Changmou Xu, Ph.D., says. This waste, known as pomace, can cause surface and ground water pollution because pesticides and fertilizers used on the grapes can leach into the environment. In addition, the soil can become more acidic because of the pomace's low pH. Grape waste left in landfills can even contribute to the spread of diseases because it can attract flies and pests, he says.

The global wine industry produces about 14 million tons of pomace every year, according to the Food and Agriculture Organization of the United Nations, and winemakers struggle with what to do with it. Xu's group at the University of Nebraska-Lincoln wants to rebrand grape waste as a renewable resource, using it to produce antioxidants, grape oils and dietary fibers for health products. Co-opting pomace for commercial use is a one-two punch to winemakers' waste problems. Not only could it increase the economic value of the grape and wine industry, it could also minimize environmental contamination, Xu explains.

Pomace can be used as compost or fertilizer, and some winemakers have even produced a weaker, "second wine" by soaking waste grape skins in water and fermenting the mixture. But grape pomace is also a rich source of natural antioxidants such as proanthocyanidins, anthocyanins and ellagic acid. These antioxidants bind to free radicals -- toxic byproducts of oxygen metabolism that can harm the body -- so those radicals can't bind to and damage cells. These pomace ingredients, as well as grape seed oil, have been used in dietary supplements, pharmaceuticals and cosmetics.

Using a holistic approach, Xu's team is identifying optimal technologies to extract, separate and identify nutrients from grape pomace, and then they will use those nutrients in commercial products. The technologies also must remove any pesticides that would have been used on the grapes. The group has collaborated with biologists to investigate whether polyphenols found in pomace are effective against foodborne pathogens like *E. coli* and *Salmonella*. They also have worked with physiologists to study how supplementing sows' diets with grape pomace from late gestation through lactation would affect the gut health, pre-weaning survival and growth in young piglets.

"We are also developing some applications in food, aiming to substitute artificial antioxidants with natural antioxidants from grapes for a 'clean label' food with only natural ingredients," Xu says. The researchers separated the phenolic compounds from the other components of the pomace, including any pesticides that were used on the grapes, and added them to popular foods high in fat, like mayonnaise and ranch dressing. Before adding the phenolic compounds, the team also tested them to be sure they met safety requirements. They found that these compounds significantly inhibited lipid oxidation, extending the fatty foods' shelf life, especially when the samples were exposed to a warm temperature. Xu says that in a previous study, his team used polyphenols to reduce acrylamide formation in potato chips by 60 percent.

"We are continuing to enhance efficiency of this inhibition and aim to make the phenolic compounds' performance comparable with that of ethylenediaminetetraacetic acid (EDTA), which is an artificial antioxidant," Xu says. Although EDTA is widely added to foods, cosmetics and medicine and is safe to use, it is not a very label-friendly ingredient in the current consumer climate. People are looking for food labels listing natural ingredients, Xu says. And grape pomace could provide one way to fulfill that need.

A press conference on this topic will be held Monday, March 19, at 10 a.m. Central time in the Ernest N. Morial Convention Center. Reporters may check-in at the press center, Great Hall B, or watch live on YouTube http://bit.ly/ACSLive_NOLA. To ask questions online, sign in with a Google account.

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Title

Value-added and sustainable product processing of by-products from agricultural commodities -- with grape as the main model

Abstract

Grape is one of the most valued conventional fruits in the world with more than 75 million tonnes produced yearly, according to the FAOSTAT (2014). Considering approximately 75% of the whole grape production is utilized into winemaking, and 25% of the original grape weight is pomace (skin, seeds and stalks), there is around 14 million tonnes of winery pomace produced every year globally. Large amounts of pomace are produced during a short period of harvesting, and discarded in land field may be detrimental to the

environment, such as surface and ground water pollution, foul odor, flies and pests attraction that may spread diseases and oxygen depletion in soil and ground waters by tannins and other compounds. In order to reach a sustainable and environment-friendly winemaking process, there is a need of a waste reduction strategy. Considering a significant amount of bioactivity compounds (polyphenols, dietary fibre, and oil) retained in the winery pomace, the potential use of grape by-products can be a promising alternative, not only motivated by environmental issues, but also by the possibility of enhancing food quality and developing high added-value ingredients and products. Furthermore, the increasing consumer demand for the use of natural over synthetic compounds for a clean label food, and the increased attention to sustainable of agricultural practices, also are driving forward the applications for grape pomace. Therefore, this presentation will address the factors during the value-added and sustainable product processing of by-products from grapes, and the potential applications or product development of grape pomace, such as in functional food, food processing, cosmetics, pharmaceuticals, and supplements.

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