Keeping filler ingredients out of your cup of coffee

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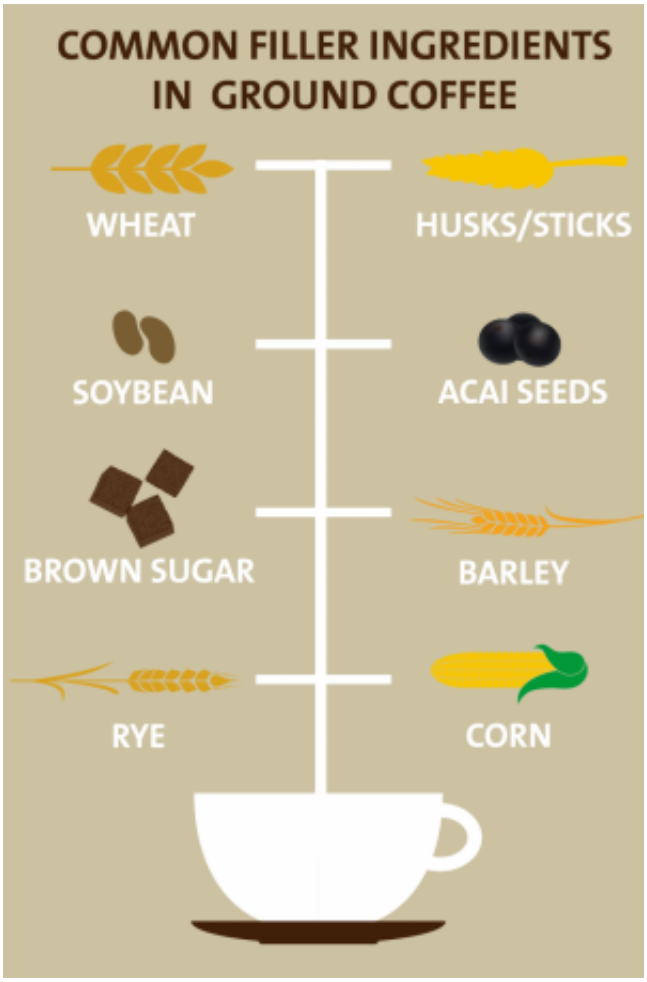

A new test could detect unwanted fillers like wheat, corn and soybeans that might be lurking in your cup of coffee. Credit: American Chemical Society

Coffee drinkers beware: Surprise ingredients that are neither sweet nor flavorful may be hiding in your coffee, and growing coffee shortages may increase the chance of having these fillers in your cup of joe in the future. The good news is that a highly accurate test is in the works to quickly find coffee containing unwanted fillers before the beverage reaches stores and restaurants.

These extra ingredients, though not harmful, make ground coffee go farther and increase profits for producers, according to researchers. Their report will be part of the 248th National Meeting & Exposition of the American Chemical Society (ACS).

A test to detect counterfeit coffees is becoming more important in light of growing shortages in regions, such as Brazil, where droughts and plant diseases have dramatically cut back coffee supplies. "With a lower supply of coffee in the market, prices rise, and that favors fraud because of the economic gain," says research team leader Suzana Lucy Nixdorf, Ph.D.

In 2012, a study from the U.K.'s Royal Botanic Gardens and the Environment stated that 70 percent of the world's coffee supply might disappear by 2080 because of conditions caused by climate change. But shortages due to more immediate issues already are occurring. The coffee-rich country of Brazil typically produces 55 million bags of coffee each year. But according to some reports, the projected amount for 2014 will likely only reach 45 million bags after this January's extensive drought. That's about 42 billion fewer cups of coffee for this year.

Now, however, Nixdorf and her team at State University of Londrina in Brazil have developed a way to nip coffee counterfeiting in the bud.

"With our test, it is now possible to know with 95 percent accuracy if

coffee is pure or has been tampered with, either with corn, barley, wheat, soybeans, rice, beans, acai seed, brown sugar or starch syrup," she says. The problem, she explains, is that "after roasting and grinding the raw material, it becomes impossible to see any difference between grains of lower cost incorporated into the coffee, especially because of the dark color and oily texture of coffee."

In new research, the team is now analyzing several fillers that are considered impurities rather than adulterants. These impurities can even be parts of the coffee plants, introduced at harvest, that are not really supposed to be in the final product. Wood, twigs, sticks, parchment, husks, whole coffee berries or even clumps of earth that are almost the same color as coffee have been found. Identifying them is essential because if there is a large amount of impurities, they were probably added purposefully—not by accident, as some producers claim, says Nixdorf.

Currently, tests to detect these unwanted additives require scientists to check the coffee, and those tests are subjective — not quantitative, she says. With these tests, the scientists look at the coffee under a microscope or identify various additives by simply tasting the coffee. In contrast, the new test uses liquid chromatography and statistical tools. This gives her team a much closer look at the ingredients in an unbiased way, according to Nixdorf. Chromatography is a powerful analytical technique that is very sensitive and highly selective.

Because much of the coffee is composed of carbohydrates, researchers could develop a "characteristic fingerprint" when using chromatography that separates out the real coffee compounds, says Nixdorf. The added, unwanted grain fillers generate different levels of sugars than the natural ingredients, so they are easy to identify, she explains.

More information: Title: Strategy to detect adulterations in ground

roasted coffee: An association of carbohydrates content and profiles with chemometric tools

Abstract

Coffee is one of the most popular drinks, consumed for its refreshing, stimulating taste and health benefits; and ranked as second-traded worldwide commodity. Its high-price combined with certain ground roasted coffee characteristics, like brown color, particle size and oily texture, attracts fraudulent adulteration, allowing cheapest admixture of roasted and grinded fillers. As a matter of economic order, husks, sticks, corn, cocoa seeds, barley, wheat middling, chicory, soybean, triticale and acai seeds are commonly added. Since simple visual inspection enables to differentiate genuine ground roasted coffee from adulterated one; microscopy is conventionally applied. However, this technique is limited to semi-quantitative assays, requiring trained and skilled analysts. So, it remains great challenge to develop a non-subjective method, selective for distinct markers and quantitative reproducible for industrial quality control. Beside, carbohydrates as major grains macronutrient stand as tracer by its profile and content to assess coffee authenticity. Despite efforts from studies, food matrices complexity and variability still requires strategies to uncover adulteration. Thus, this approach uses HPLC analyses associated with chemometric tools on new analytical resources for detection of ground roasted coffee adulterations. A validated high-performance anion-exchange chromatography with pulsed amperometric detection method was investigated to determine total carbohydrates content profiles of pure roasted coffee beans and adulterants. The influence of each matrix was evaluated employing a simplex-centroid design for experiments with mixtures, relating mixing ratio with each monosaccharide by its response surfaces. Proposed models were effective in recognition and prediction of mixtures concentration, thereby allowing distinction of genuine coffee by principal component analysis. Predominantly, pure roasted coffee presented higher levels of galactose and mannose. Profile of diverse

roasted grains as sources of fraud will be shown. All results correspond to polysaccharides from pure raw grains, confirming this approach as a feasible analytical tool for detect adulteration of ground roasted coffee.

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