Finally, a way to authenticate premium chocolate

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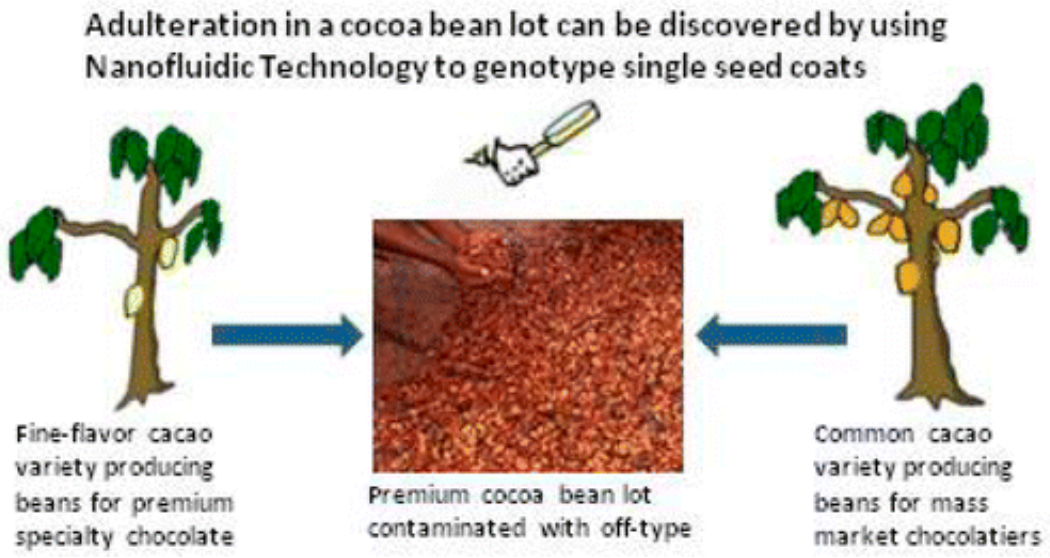

For some people, nothing can top a morsel of luxuriously rich, premium chocolate. But until now, other than depending on their taste buds, chocolate connoisseurs had no way of knowing whether they were getting what they paid for. In ACS' *Journal of Agricultural and Food Chemistry*, scientists are reporting, for the first time, a method to authenticate the varietal purity and origin of cacao beans, the source of chocolate's main ingredient, cocoa.

Dapeng Zhang and colleagues note that lower-quality cacao beans often

get mixed in with premium varieties on their way to becoming chocolate bars, truffles, sauces and liqueurs. But the stakes for policing the chocolate industry are high. It's a multi-billion dollar global enterprise, and in some places, it's as much art as business. There's also a conservation angle to knowing whether products are truly what confectioners claim them to be. The ability to authenticate premium and rare varieties would encourage growers to maintain cacao biodiversity rather than depend on the most abundant and easiest to grow trees. Researchers have found ways to verify through genetic testing the authenticity of many other crops, including cereals, fruits, olives, tea and coffee, but those methods aren't suitable for cacao beans. Zhang's team wanted to address this challenge.

Applying the most recent developments in cacao genomics, they were able to identify a small set of DNA markers called SNPs (pronounced "snips") that make up unique fingerprints of different cacao species. The technique works on single cacao beans and can be scaled up to handle large samples quickly. "To our knowledge, this is the first authentication study in cacao using molecular markers," the researchers state.

More information: "Accurate Determination of Genetic Identity for a Single Cacao Bean, Using Molecular Markers with a Nanofluidic System, Ensures Cocoa Authentication" J. Agric. Food Chem., 2014, 62 (2), pp 481–487. DOI: 10.1021/jf404402v

Abstract
Cacao (Theobroma cacao L.), the source of cocoa, is an economically important tropical crop. One problem with the premium cacao market is contamination with off-types adulterating raw premium material. Accurate determination of the genetic identity of single cacao beans is essential for ensuring cocoa authentication. Using nanofluidic single nucleotide polymorphism (SNP) genotyping with 48 SNP markers, we generated SNP fingerprints for small quantities of DNA extracted from

the seed coat of single cacao beans. On the basis of the SNP profiles, we identified an assumed adulterant variety, which was unambiguously distinguished from the authentic beans by multilocus matching. Assignment tests based on both Bayesian clustering analysis and allele frequency clearly separated all 30 authentic samples from the non-authentic samples. Distance-based principle coordinate analysis further supported these results. The nanofluidic SNP protocol, together with forensic statistical tools, is sufficiently robust to establish authentication and to verify gourmet cacao varieties. This method shows significant potential for practical application.

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