# Product Identification Versus Production Verification

Evolving developments in technology, combined with policy and/or regulatory change, can sometimes lead to misleading interpretations of how new technologies can come to the rescue and fill gaps created by change. A recent example is the change in Kernel Visual Distinguishability (KVD) requirements in western Canadian wheat deliveries. Changes to KVD in Western Canada that introduced producer declarations of "class" eligibility have also involved discussions about how to identify, or verify, the identity of varieties delivered by grain growers. In many of these discussions, terms with very different meanings, like *identification* and *verification*, *seed* and *grain*, and varietal *purity* and varietal *identity* are used interchangeably and appear to be the same but really are distinctively different in their definition and purpose. These differences can lead to grain growers' misunderstanding their options for maintaining the identity of their crops. To clarify the terminology, and update growers on new variety and genetic testing technologies, this article discusses the changing role of varietal identity.

Genetic testing examples of identification and verification are popular today, from the diagnostic kits in drugstores to TV programs like *CSI* and *Forensic Files*. DNA testing is most often used in these tests for *verification* (matching samples of known origin to each other in order to prove a hypothesis or a match that is suspected) and occasionally for *identification* (matching a sample of unknown origin to those in a database of hundreds or millions of DNA fingerprints). *CSI* detectives identify criminals only if their DNA fingerprint is on record or if they are comparing a DNA sample from the crime scene to a DNA sample received from a suspect. Currently, not all varieties have been fingerprinted, so being able to see a fingerprint does not necessarily translate into the identification of which variety the fingerprint may represent.

For commercial wheat deliveries, a sample declared to be AC Barrie may be tested to *verify* that it conforms to markers used by the Canadian Grain Commission. Without additional testing and expense, however, the test does not tell you what else it is – the impurities and/or other varieties present in the sample are not *identified*. Although forensic and diagnostic genetic testing is advancing rapidly, there is a huge practical difference between *verifying* what is suspected (such as the sample from a crop that was grown from planting Certified AC Barrie seed) and *identifying* what is unknown.

For the seed certification process, varieties are defined in international standards like the OECD Seed Schemes or the Association of Official Seed Certifying Agencie (AOSCA) by their distinguishing characteristics. The definition of variety for seed certification includes genetic characteristics, but for most crop kinds the visual distinguishing characteristics, are what has been traditionally and cost effectively *verified*. So the use of genetic testing in seed variety *verification* testing has usually only been required for auditing the certification of those varieties with identical phenotypes (visual characteristics) but different genetic identities (or non-visual distinguishing characteristics).

For seed certification, varieties are defined by the variety description of their distinguishing characteristics, whether visual or non-visual. Starting with parent seed traceability coupled with requirements for previous land use, isolation distance and physical impurities, it has been primarily the phenotypic (generally visible) characteristics of varieties, rather than genotypic (genetic level) characteristics, which are monitored closely to ensure that seed crops of each variety remain true to their breeders' descriptions and remain fit for the purpose which that variety was developed. When requirements for distinguishing characteristics are not visual, additional verification testing is used.

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In the Canadian seed certification system today, variety *verification* seed testing is conducted in Canadian Food Inspection Agency (CFIA) labs and field plots to verify conformity, with the distinguishing characteristics prescribed in the official variety description and contained in the official reference sample of Breeder seed. These variety verification tests are used primarily to audit the seed crop varietal certification process. Lab analysis is performed for some crop kinds to determine if what appears as off-types in the field are actually genetic off-types, or variants of the same variety. DNA tests, protein tests and electrophoresis are some of the lab technologies used for auditing and verifying the purity and identity of varieties in the seed certification system today.

Lab technology related to genetic identity verification testing has developed to the stage of being fairly reliable for some crop kinds. Identification testing of unknown varieties and rapid, reliable, cost-effective variety identification testing technology are still a few years away for most crop kinds. Much more specialized sampling and testing systems, than used for traditional physical purity and germination testing, are required to ensure that genetic testing results are consistent, accurate and dependable. Developing technology and appropriate methods for cost-effective, reliable identification of varieties is a long term research project for many reasons but especially because test methods are not yet recognized internationally and are often being used for very different purposes.

Another variable that makes variety identification difficult in some commercial grains is the degree of genetic drift over several generations of farm-saved crop production. Your DNA does not change when you reproduce and have children but the DNA of your children will be different than yours. Plant DNA is also not stable from generation to generation so this instability needs to be recognized from generation to generation of seed production. The reality of variations and mutations from generation to generation in seed as it is multiplied in various environments lends credibility to the process-based requirements of the traditional seed varietal certification process in Canada and OECD and AOSCA international seed standards associations.

Genetic testing technology may eventually replicate the results of the internationally recognized certification process for seed varietal purity assurance but not likely the economics. Reliable quality control, especially for bio-products, comes from having a cost effective, usually third-party audited, certification process that product testing technology can audit – not replace. No wonder, in the past 20 years that most food and feed safety regulatory programs in the world have moved to process certification, based on principles that are audited by verification testing of product quality or purity. No wonder, that most global industries have converted to process certification standards to increase the reliability of their product quality control programs. These industries maintain process-based quality certification systems and use product testing as audits of their process to verify 95% or 99% compliance depending upon the confidence level required for the risks involved.