

amc technical brief

Analytical Methods Committee

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GMO Proficiency testing: Interpreting z-scores derived from log-transformed data

In some proficiency tests concerned with measuring the proportion of genetically modified organism (GMO) in food the results produced are log-transformed (converted into logarithms) before z-scores are calculated [1]. The transformation can be justified both theoretically and practically. However, the transformation gives rise to z-scores that are not on the same type of scale as the original data, and are therefore less readily interpreted. A certain amount of background in logarithmic transformation may be

le. It is asymmetric, with a positive skew and all values of x necessarily greater than zero. If alternatively we plot the density against the logarithm of x , we see the familiar shape of the normal distribution (Figure 2). (Note that logarithms base ten are implied throughout this Brief.)

Definition: a variable x is lognormally distributed if $\log x$ is normally distributed.

While all normal distributions are essentially the same shape, the shape of a lognormal distribution depends on its RSD (relative standard deviation, here expressed as a fraction). For example, the highly-skewed distribution in Figure 1 has an RSD of 0.3, while Figure 3, also a lognormal but with an RSD of 0.1, shows only a slight skew. (For reference, results from a round of a GMO proficiency test commonly have an RSD of about 0.7.)

Data from GMO proficiency testing

At present, nearly all quantitative measurements of a genetically modified species in a food are based on the polymerase chain reaction (PCR). In interlaboratory studies such as the proficiency test, the results almost invariably show a strongly skewed distribution of results, Figure 4 for example. There are *a priori* reasons for expecting this outcome. Firstly th

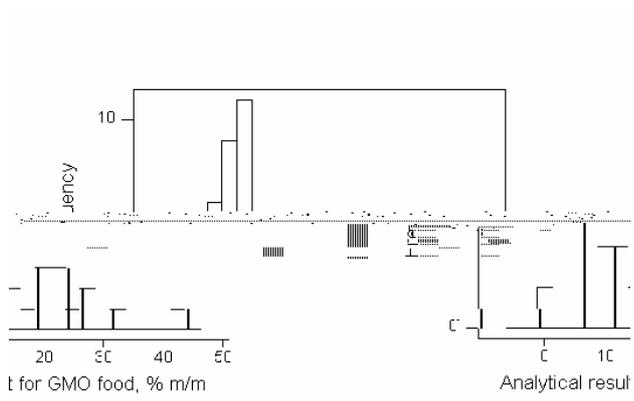


Figure 4. Results from a single round of a proficiency test involving measuring the concentration of GMO soya.