Assays for quality in vegetables are not generally considered difficult. Even the constituents of flavors may be determined readily by modern analytical methods. Characteristics such as color, sweetness, tenderness, crispness, pungency, and acidity can be readily observed. The apparent simplicity of a study of quality often obscures its complexity.

The edible portion of a vegetable plant may be one or more of its various parts - seeds, fruits, flowers, stems, leaves, roots, and bulbs. The characteristics of quality in each part may be unique. Also, quality may depend upon use of preference of the user.

A characteristic of quality often depends upon a large number of constituents. Flavor is a good example. The genetic control of a contributing constituent may be complex. When this is the case, measurements of the particular quality are not likely to yield useful information in a study of inheritance. The problem would have to be separated into the genetic control of its individual components and these investigated separately.

To further complicate a study of quality, vegetables are usually harvested when the edible portion is undergoing rapid accumulation of constituents, metabolism, and increase in size. There is seldom a definite criterion of edible maturity. Sampling, then, becomes a major source of error.

Development of the constituents of quality in vegetables is usually subject to the environment and condition of the plants. Weekly differences in carotene content of tomatoes may vary as much as 400 percent depending upon temperatures just before ripening. Even if constituents can be readily measured, the values may not reflect genetic potential.

A study of the relative contributions made by the constituents to an aspect of quality could have important advantages to the geneticist or plant breeder. It could result in reduced error in sampling and more accurate assays, better selection of parents for crosses, and more specific tests for a character. Field selection for a tomato that would color at high temperatures has resulted in the selection for better foliage, but not for development of lycopene at high temperatures. Improvement in quality is often hampered by misinformation. Pectin, which is generally thought to make a major contribution to viscosity of tomato juice, has been found to have very little effect on consistency.

If the constituents contributing to quality are to be studied, analytical short-cuts must be employed. Conventional methods of analysis are too time-consuming to be used with the large number of progenies or samples to be assayed. Instrumental analyses and their interpretations in various aspects of quality should be investigated. With nuclear magnetic resonance (NMR) spectrometry the oil content of a single seed or a 20-gram sample can be determined in about one second. Since this is a non-destructive analysis, the seed can then be planted. An equally rapid method for total protein based on x-ray absorption is a definite possibility. These, together with gas-liquid chromatography (GLC), are just examples of what may be expected from instrumental analyses in the future.

Genetic control of the constituents of quality must depend basically upon the synthesis of enzymes. The S3 and B3 genes in sweet corn seem to be due to a deficiency of ADP-glucose pyrophosphorylase. This condition results in a decrease in the synthesis of starch and thus the accumulation of sugars. In some cases, instead of assaying for the constituents, better genetic information may be obtained by studying the enzymes controlling them.

**Literature Cited**