WAXY AND NONWAXY

PRINCIPLE

Kernels are crushed or split separately to expose starch which is then stained with dilute iodine solution. Starch in waxy grain stains red and that in nonwaxy grain stains blue (Note 1). The concentration of waxy or nonwaxy grain is determined from the relative quantities of red- and blue-staining kernels in the sample.

SCOPE

The method applies to waxy and nonwaxy corn.

SPECIAL APPARATUS

1. Grain Cutter: A commercially-available grain cutter, or equivalent, can be used to cut the whole kernels. Alternatively, the kernels may be crushed with the aid of a special grain-splitting plate (Note 2).

2. Sprayer: A sprayer is recommended consisting of an atomizer top (operated by low-pressure compressed air) connected to an Erlenmeyer flask by means of a standard-taper glass joint (Note 3).

REAGENTS

Iodine Solution, 0.01 *N*: Dilute 10 mL of 0.1 *N* iodine solution to 100 mL volume with purified water.

PROCEDURE

Mix sample thoroughly, and randomly select 100 kernels. Cut or crush kernels to expose starch in hard endosperm; do not contaminate starch in one kernel with that from another. Place cut or crushed kernels (or suitable portions thereof) on a large porcelain plate or a starch-free filter paper. Spray with sufficient iodine solution to produce a distinctive red or blue stain on the exposed starch (Note 4).

Count the "blue-staining" kernels (Note 5).

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CALCULATION

% Nonwaxy Grain = Total "Blue-Staining" Kernels

NOTES AND PRECAUTIONS

1. Starch in waxy grain is composed entirely of branched polymers which stain red with iodine. Starch in nonwaxy grain contains amylose (linear fraction) which stains blue with iodine.

2. The grain-splitting plate is constructed of heavy-gauge steel and contains 100 symmetrically-arranged circular depressions. The bottom of each depression has the shape of a raised cone. Diameter of the depressions is slightly in excess of the maximum kernel diameter, and the depth is such that all kernels will be exposed above the top surface of the plate (to facilitate crushing). A heavy-gauge cover plate is constructed to permit clamping onto the splitting plate. After loading with grain and clamping the cover plate in position, place grain-splitting assembly on a solid surface. Several sharp blows over the surface of the cover plate serve to crush the grain. Carefully remove the cover plate and spray the crushed kernels with iodine solution.

3. A 1 pint bottle equipped with a hand-operated atomizer is a convenient sprayer.

4. Some investigators prefer to stain the exposed starch by soaking cut kernels in a dilute iodine solution. If this procedure is followed, proper iodine concentration and soaking conditions should be established in advance to guarantee that starches in waxy and nonwaxy grain will produce the characteristic red and blue colors, respectively.

5. Duplicate analyses are recommended and results should agree within 2% absolute. Report the average of duplicate results, retaining 2 significant figures.

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METHOD HISTORY

Corn, Waxy and Nonwaxy (A-28), Date of Acceptance 11-17-1959, Revised 4-01-2009.