Note on the Enzymatic Determination of Starch in Corn Starch and Corn Meal[1]

J. R. DONELSON and W. T. YAMAZAKI[2], Soft Wheat Quality Laboratory, Crops Research Division, Agricultural Research Service, USDA, Wooster, Ohio

The Donelson-Yamazaki procedure for enzymatic determination of starch in wheat and wheat fractions (1) may be modified for use in estimating the starch content of ordinary and waxy corn starches and corn meals. The procedural modification consists merely of increasing the boiling-gelatinization period from 2 to 10 min. Reagent preparations, sample sizes, and blank values remain the same.

To express results in terms of starch content, a conversion factor is applied to the reducing-sugar values which result from enzymatic hydrolysis of the gelatinized starch in the sample. This factor represents the reciprocal of the mean fraction reducing-sugar yield derived from starches and adjusted to a pure, dry starch basis. The average reducing-sugar yield obtained for three ordinary and two waxy corn starches was 64.8% (±0.08), which gives a conversion factor of 1.54, 100/64.8, for corn starch. The conversion factor for wheat starch was found to be 1.58 (n = 30). Similar studies on high-amylose corn starches (classes 5, 7, and 8) indicate that this enzymatic starch procedure is not applicable to these genetically modified materials.

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[1]Co-operative investigation between the Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture, and Department of Agronomy, Ohio Agricultural Research and Development Center.

[2]Chemist and Research Chemist, Soft Wheat Quality Laboratory, Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture, Wooster, Ohio.

TABLE I. STARCH CONTENTS OF STARCHES AND MEALS FROM ORDINARY AND WAXY CORN DETERMINED BY THE POLARIMETRIC AND ENZYMATIC PROCEDURES (DRY WEIGHT BASIS)

Sample		Starch Content	
		Polarimetric %	Enzymatic %
Ordinary Corn Starch	A	99.2	99.2
Ordinary Corn Starch	B	99.0	98.8
Ordinary Corn Starch	C	99.0	99.1
Waxy Corn Starch	D	99.3	99.0
Waxy Corn Starch	E	99.5	99.1
Ordinary Corn Meal	1	67.4	67.5
Ordinary Corn Meal	2	67.3	68.2
Ordinary Corn Meal	3	67.3	68.2
Ordinary Corn Meal	4	68.7	69.7
Ordinary Corn Meal	5	67.0	67.5
Waxy Corn Meal	6	68.3	68.6
Waxy Corn Meal	7	67.3	66.9
Waxy Corn Meal	8	63.8	64.9

TABLE II. EFFECT OF GRANULATION OF CORN MEALS ON APPARENT STARCH CONTENT (DRY WEIGHT BASIS)

Sample		Enzymatic Starch			Polarimetric Starch[a]
		Screen Opening 0.024 in.	Screen Opening 0.012 in.	Screen Opening 0.008 in.	
		%	%	%	
Ordinary Corn Meal	2	54	60	68	67
Ordinary Corn Meal	3	49	54	67	67
Ordinary Corn Meal	4	54	62	70	69
Waxy Corn Meal	8	57	...	65	64

[a]Samples passed through 0.008-in. screen.

Starch determinations were made on a group of ordinary and waxy corn meals and corn starches by the above method and by the polarimetric procedure of Earle and Milner (2). The data (Table I) indicated that comparable results were obtained by the two methods.

Particle size is a vital factor to be considered for enzymatic starch determinations of corn meals. We have found that meals must be ground finely enough to pass completely through an 0.008-in. screen opening. Data showing the effect of sample fineness on starch yield are given in Table II. Particle size did not appear to be a significant factor in the polarimetric procedure with these grinding treatments.

Literature Cited

1. DONELSON, J. R., and YAMAZAKI, W. T. Enzymatic determination of starch in wheat fractions. Cereal Chem. 45: 177-182 (1968).
2. EARLE, F. R., and MILNER, R. T. Improvements in the determination of starch in corn and wheat. Cereal Chem. 21: 567-575 (1944).

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