A NOTE ON AN IMPROVED DENATURATION TEST FOR GLUTEN BASED ON SOLUBILITY IN ACETIC ACID[1]

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A number of modifications are proposed to extend the usefulness of the solubility test described by Blish (2) for evaluating the extent of denaturation of wheat gluten. The modifications consist in lowering the concentrations of gluten and of acetic acid, eliminating the use of alcohol, and substituting vigorous stirring for overnight standing and also centrifugation for filtration. These changes have increased the speed, simplicity, and accuracy of the test.

The modified method is: Disperse 0.320 g. (dry basis) of gluten in 100 ml. of 0.01*N* acetic acid by agitation in a Waring Blendor[2] for 3 minutes. Centrifuge at 3300 × G for 30 minutes. Determine the percent of total nitrogen remaining in supernatant by the Kjeldahl procedure.

This method provides a greater solubility differential between undenatured and extensively denatured gluten than does the Blish method, largely because the undenatured gluten is more soluble. Typical values for percent of soluble nitrogen are as follows:

	Blish Method	*Improved Method*
Undenatured gluten	76	89
Gluten heated at 90°C. for 30 minutes	7	5

Another advantage of the present method is that it gives reliable results with lyophilized glutens. For example, when a vacuum-dried gluten was dispersed in 0.01*N* acetic acid and lyophilized, its solubility

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[2] Mention of firm names or trade products does not constitute endorsement or rejection by the U.S. Department of Agriculture over others of a similar nature not mentioned.

by our method was 89% before and 91% after lyophilization. These values are in keeping with literature reports that lyophilization does not denature gluten (1,3). In contrast, when determined by the Blish method, the solubility dropped from 76% before to 58% after lyophilization. Presumably this decrease in solubility resulted from partial denaturation of lyophilized gluten by the alcohol used as a wetting agent.

The response of solubility to increasing extents of denaturation is illustrated by results obtained with laboratory-prepared gluten heated in water:

Treatment	*Soluble N*
	%
Unheated, not dried	92
60°C., 15 minutes, not dried	93
80°C., 15 minutes, not dried	83
95°C., 5 minutes, not dried	50
95°C., 15 minutes, not dried	21
95°C., 15 minutes, dried at 48°C.	9
95°C., 30 minutes, dried at 48°C.	2

Commercially prepared vital glutens gave values between 84 and 93% soluble nitrogen. This range may reflect differences either in the original wheats or in the extent of denaturation during manufacture.

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Literature Cited

1. ADAMS, G. A. New laboratory methods for drying wheat gluten. Cereal Chem. **29:** 312–314 (1952).
2. BLISH, M. J. Wheat gluten. *In* Advances in protein chemistry, ed. by M. L. Anson and J. T. Edsall, vol. 2, pp. 337–359. Academic Press: New York (1945).
3. LUSENA, C. V. Preparation of dried native wheat gluten. Cereal Chem. **27:** 167–168 (1950).