

COMMUNICATION TO THE EDITOR

Improvement of Semolina Quality through Steam-Treatment of Durum Wheat

DEAR SIRS:

Traditionally it has been considered to be detrimental to the quality of durum wheat to apply heat during its processing into semolina; this was alleged to result in a loss of color. Recent work in this laboratory has indicated that this need not be the result. We have applied steam to durum both before and after washing. Under properly selected conditions of steam pressure and time of treatment, the lipoxidase activity of the resulting semolina is reduced to zero. Yellow pigment content of semolina is essentially unchanged, loss of pigment during pasta processing is greatly reduced, and a significant improvement in macaroni color results.

The steam-treatment has been applied in an experimental wheat washer constructed several years ago in this laboratory. The wheat is run into a vertically rotating bin similar to the rotating tub on early automatic washing machines; it spreads into a thin layer against a screen forming the outside edge of the bin and steam is then let in through jets inside and outside the screen while the bin is rotating at 485 r.p.m. Steam pressure is controlled by a throttle valve, and we have used pressures of 10 to 60 lb. for various lengths of time. The germ, bran, and aleurone layers appear to be the areas chiefly affected by the momentary application of high temperatures. Semolina pigment losses are minimal at the higher steam pressures (40–60 lb.) and short application times (≈ 1 min.). Under these conditions the temperature of the wheat immediately after treatment is not particularly high (approx. 120°F.). It seems likely that the rapid rotation of the wheat prevents excessive temperatures from developing in the central endosperm. Lower steam pressures and the longer times required to obtain the desired enzyme inactivation result in slightly greater endosperm pigment losses. This suggests that hot-conditioning of durum (radiator temperatures above 150°F. and times of a half hour or more) would probably result in significant endosperm pigment losses.

The objective in applying steam conditioning to durum wheat is to inactivate the enzyme lipoxidase and thus diminish or eliminate the loss of semolina pigment during pasta processing. This is only practical, however, if no serious side effects are produced by the steam-treatment. The major side effect appears to be the change in gluten quality which occurs along with the inactivation of lipoxidase. In most of the durum wheats studied thus far, conditions required to inactivate lipoxidase result in a distinct change in gluten quality. However, current North American durum varieties are somewhat on the soft side in gluten quality, and the extent of this change does not appear to be sufficiently drastic to have any serious effects on the processing characteristics of the semolina. The change in gluten quality might even be considered to be an improvement. With certain other types of durum having much stronger types of gluten, however, the application of steam at a level sufficient to inactivate lipoxidase can result in a serious degree of gluten damage.

A drawback from the point of view of commercial application of this type of treatment is that all samples of durum do not respond to a given treatment to the same degree. Conditions which work well with one grist might not produce equally desirable results with another grist. The steam-treatment has been applied in a commercial mill, however (with a Forster conditioner), with acceptable results (Table I).

Milling characteristics are not markedly affected by the levels of treatment used in this work. Tempering time, after steam-treatment, can be shortened to 2 hr. with no change in semolina yield; semolina ash content, under these conditions, may be slightly improved.

The influence of the effective levels of steam-treatment on the cooking characteristics of pasta seems to be of a minor nature. Judged by the standard (AACC) cooking tests, we have detected no significant changes in cooking quality. However, in some experiments, using a measuring device recently developed in this laboratory, we have noted that cooked spaghetti produced from steam-treated wheat is slightly softer than the control product.

Some representative data from successful applications of steam-treatment are indicated in Table I. Samples A, B, and C were different samples of com-

TABLE I
SOME REPRESENTATIVE RESULTS^a

	A		B		C		D	
Steam pressure, lb.	(0)	40	(0)	60	(0)	12	(0)	^b
Time, min.	(0)	1	(0)	3/4	(0)	4	(0)	^b
Semolina yield, %	(56.1)	54.5	(56.6)	56.8	(54.5)	54.7	(53.6)	54.1
Semolina ash, %	(....)	(0.58)	0.56	(0.60)	0.54	(0.60)	0.65
Lipoxidase, units	(28)	2	(20)	0	(18)	0	(17)	4
Farinograph development time, min.	(2.25)	6.50	(3.25)	5.25	(2.75)	6.00	(3.25)	6.00
Semolina pigment, p.p.m.	(5.13)	5.00	(5.05)	4.94	(5.22)	4.98	(5.30)	5.35
Macaroni pigment, p.p.m.	(3.86)	4.81	(3.91)	4.57	(4.05)	4.84	(4.23)	4.73
Pigment loss, %	(24.8)	3.8	(22.2)	7.4	(22.4)	2.8	(20.6)	11.6
Macaroni brightness, %	(69.0)	70.4	(70.4)	70.0	(72.8)	72.4	(68.6)	69.7

^a Control indicated in parentheses.

^b Arbitrary steam-treatment in a commercial mill.

mercial grades of Canadian-grown durums treated and milled in the laboratory. Sample D was treated in a commercial mill using their normal Canadian durum grist, and milled in the laboratory. Work on this treatment is continuing.

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