Paper on Adulterations of Groceries

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PAPER

ON

THE ADULTERATIONS OF GROCERIES.

BY

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THE object of this paper is to show the general character of some of the staple groceries actually used in the State of Massachusetts; and the articles selected for this investigation were more especially those which have been suspected of adulteration with some mineral substances. For this purpose, flour, sugar, bread-soda, cream of tartar, and baking-powders were chosen.

In order to accomplish the object more effectually, the samples have been purchased, in every case, of the retail dealers in the several towns, without any suspicion on their part that the articles were to be tested. Endeavor was made to ascertain the manufacturer's name, if the article was sold in bulk. The more intelligent dealers readily gave the desired information. In many cases the clerk only was seen, and he did not know about the matter; in some cases the dealer himself professed not to know. In a few instances, the question seemed to arouse suspicion.

Nearly all the so-called "first-class" stores contain the best of articles. If they have a cheaper grade, they know its quality, and sell it only when something cheap is demanded.

Few persons are in a better position to know the ignorance and superstition of even seemingly intelligent people than a grocer in one of the larger inland towns. These ignorant and superstitious notions must be accepted, if the trade of the people is to be retained. One of the lasting prejudices is seen in the case of saleratus. As is well known, one finds in nearly all stores both "saleratus" and "soda," or "bread-soda." Some customers always purchase soda: some will not have it at any price, "Saleratus is so much stronger." Others say, "Soda is so much stronger," or, "It makes whiter bread."

The question, "What's in a name?" becomes all-important, not only to the dealer in groceries, but also to the manufacturer. One firm labels its packages "Pure bi-carbonate of soda. Free from all impurities contained in the best saleratus; twice the strength of pearlash saleratus." Another firm, on the same street, labels its packages "Paragon Saleratus. Contains from ten to twenty per cent more carbonic acid than can be found in any other saleratus." Another label says, "The country is flooded with wretched trash under the name of saleratus; and people have been so often deceived, that they have, to a certain extent, lost confidence in saleratus as a good healthy raising." The additional inducement to purchase this saleratus is found in the following statement, also on the label: "Will produce one-seventh more bread from flour, as nothing is lost by fermentation;" while a "Super-carbonate of soda" rivals the other with, "Saves ten per cent in every barrel of flour over old methods of yeast-fermentation; and a saving of nearly one-third can be made in the shortening." The fact is, that all these names are only selling-catches for one and the same thing, — more or less carefully refined and bi-carbonated "soda-ash;" the term "super-carbonate" being used by some shrewd firms to indicate the very highest possible degree of carbonization, which is interpreted by one very knowing Yankee dealer to mean "three times carbonated."

The "soda-ash," or carbonate of sodium, made from common salt by Leblanc's process, contains more or less sulphate of sodium remaining from the first treatment with sulphuric acid, and more or less chloride of sodium from the undecomposed salt. It still retains the commercial name of "soda-ash," which was given to it when carbonate of sodium was obtained only from the ashes of sea-plants. There is probably now on sale for bread-making none of the true pearl-ash saleratus, which is bi-carbonate of potassium, made from the ashes of land-plants. Pure bi-carbonate of sodium contains fifty-two per cent of carbonic acid. Equally pure bi-carbonate of potassium contains but forty-four per cent; owing to the greater equivalent weight of potassium, which is thirty-nine, while sodium is twenty-three. Consequently a given weight of bi-carbonate of sodium will furnish more carbonic acid than the same weight of bi-carbonate of potas-

sium, or saleratus, though both may be equally pure, and perfectly bi-carbonated; and, of course, the carbonic-acid gas is the part that is essential in raising the bread.

As has been stated, in nearly every town it is possible to obtain perfectly good articles; and it is by no means certain that only poor articles are kept in the stores of meaner appearance. Of the samples of cream of tartar obtained at especially cheap-looking stores, about one-half were as good as those purchased at the best places.

One fact seemed to be established in the course of this investigation: that the retail dealers, as a rule, sell what they buy, without change, and that whatever adulteration exists is to be found among the manufacturers and wholesale dealers. The object of the retail dealer is to buy, as cheaply as he can, any article that he can sell. If his customers will pay only eight cents a quarter for cream of tartar, he must buy so that he can sell for that sum.

The large centres of trade were visited, and information as to the districts supplied from each centre obtained. As one would suppose, Eastern Massachusetts is largely supplied from Boston and vicinity; while Central and Western Massachusetts are mainly supplied from New York and Albany, — from the latter centre chiefly. Some articles were found, purporting to come from Rhode Island and Connecticut. These were mainly in the southern central portion of the State.

When purchasing in a large town, care was taken to obtain samples from the very best and the very poorest, and also from a number of intermediate, stores. In the case of sugar, soda, and cream of tartar, it is believed that the report represents the actual quality used throughout the State.

As this report is limited in the main to the mineral adulterations, our examinations in the case of flour were confined to tests for a high per cent of ash, and for alum and lime in some form.

Twenty-five samples of flour from eleven towns have been tested: in no case has there been any evidence of mineral additions. In the poorer sections of the cities, baker's bread is almost exclusively used, so that the quality of such bread is of more importance in these quarters than the quality of the bread-making materials. Several small groceries were found, in which no soda or cream of tartar was for sale.

The reputed adulterations of sugar are glucose, chloride of tin, and chloride of calcium. Of sugar, seventy-five samples have been tested. From sixteen towns these were: —

Powdered	34
Fine granulated	26
Light brown	8
Dark brown	5
Cut loaf	2
Total	75

Not one of the sugars gave re-actions for tin. Of the white sugars, not one gave re-actions for chloride of calcium; one only out of fifty-five gave any indication of glucose, and that in a faint degree.

Of the thirteen brown sugars, seven gave slight re-actions for chloride of calcium. The worst two of these were analyzed, and gave respectively three-tenths and four-tenths of one per cent of chloride of calcium, and chloride of sodium, or salt, a quantity that might have been derived from the water used in the process of manufacture, and too little to do the least harm.

Of the thirteen brown sugars, six gave traces of reducible sugar or glucose, and three only gave considerable amounts, 8.3, 8.6, and 11.1 per cent respectively. Two of the three samples were of the darkest color found, and undoubtedly contained some molasses, which always carries a large per cent of reducible sugar, or glucose, formed in the process of the refining of the cane-juice. As honey is almost entirely composed of glucose, it is difficult to see wherein the "dangerous qualities" of the molasses glucose lie.

Of soda, the so-called "saleratus, bi-carbonate or super-carbonate, cooking-soda," — all being names for one and the same thing, — ninety-three[1] samples were obtained from thirty-five towns, twenty in packages, fifty-five in bulk, eighteen from known manufacturers. Of these, nineteen were nearly chemically pure, forty-three were good, making a total of sixty-two good. Twenty-five contained from three to sixteen per cent of chloride and sulphate of sodium; but, of these twenty-five, three only were very bad. The common

[1] Soda is largely sold in packages, hence the number of samples is smaller than in the case of cream of tartar.

salt, or chloride of sodium, and the sulphate, are simply left in from the crude soda-ash in the process of manufacture: they are not added to the carbonate for adulteration. We may dismiss the soda without fear. Nothing is cheap enough to be used for its adulteration; and the worst we have to dread is lack of purification of the crude soda-ash, which contains nothing injurious. The "wretched trash that floods the market" does not seem to be on sale in Massachusetts.

The results in the case of cream of tartar are not so favorable. As the best cream of tartar is liable to contain small quantities of tartrate of lime found in the imported argols, the samples containing less than three per cent of ~~it~~ lime are called perfectly good in the following table: —

Number of samples examined, from forty towns	160
perfectly good (fifty-eight per cent)	94
containing more than three per cent and less than ten per cent of impurities	14
consisting largely of terra-alba (sulphate of lime)	47
almost wholly of terra-alba	9
largely of acid phosphate of lime	12
wholly of acid phosphate of lime	5
largely of flour	1
	182
counted twice, as containing both acid phosphate, and sulphate	22
	160

Alum was not found in a single sample.

Of these samples, twenty-nine were put up in packages. Fourteen of these packages were marked with the maker's name and address, and warranted "strictly pure;" all of the fourteen, without exception, were good. Seven packages were found without the name of the manufacturer, only the name of the mills being given. Every one of these was adulterated; one was largely flour, the other six contained over fifty per cent of terra-alba. One other package had the maker's name, but no place of business on the label, and contained eighty-one per cent of terra alba. Two packages were labelled simply "Horsford's cream of tartar," and consisted of acid phosphate of lime.

Of twenty-four samples known to be of Boston make, only four were adulterated, and with less than fifteen per cent of

impurity. Of eight known to be of New-York make, four were good.

The price does not always indicate the quality. Some of the samples purchased for ten cents a quarter-pound were as good as others that cost fifteen cents. If one buys of the most trustworthy dealers, — the well-known and proved makers, — there will be comparatively little danger of adulteration. Not all people, however, are in a position to exercise such care in procuring the necessaries of life.

The following table will show some instructive results obtained in the course of the investigation: —

	No. of Towns.	Whole No. Samples.	No. containing less than 3 per cent impurity.	No. containing over 3 per cent impurity.	Terra-Alba.						Acid Phosphate of Lime.		
					Less than 10 per cent.	10 to 20 per cent.	20 to 50 per cent.	50 to 70 per cent.	70 to 90 per cent.	Over 90 per cent.	10 to 30 per cent.	30 to 50 per cent.	Over 60 per cent.
Cream of tartar from Eastern Massachusetts . .	26	110	73	37	3	9	9	7	2	–	9	5	2
Cream of tartar from Central and Western Massachusetts . .	14	50	21	29	3	1	8	9	3	4	5	1	3

The prevalence, in the central and western part of the State, of terra-alba or ground gypsum under the name of cream of tartar, is a very serious evil, and doubtless accounts for the great favor with which baking-powders are received in that section. One dealer in Pittsfield sells one pound of cream of tartar where he used to sell fifty, and his own was of the best quality.

Terra-alba may easily be detected by its insolubility in water. If a cupful of boiling water be poured on half a teaspoonful of good cream of tartar, it will dissolve almost instantly; whereas the quantity of terra-alba dissolved under the same circumstances is almost imperceptible. The acid phosphate of lime sold under the name of cream of tartar is about sixty per cent soluble in water; fourteen per cent of the insoluble portion is sulphate of lime left in the phosphate in the process of manufacture.

Neither the soluble nor the insoluble phosphate of lime

can be considered a harmful adulteration of bi-tartrate of potassium, ordinary cream of tartar. Terra-alba, although it cannot be classed among the poisons, is not exactly a wholesome ingredient of food. The worst feature of the use of terra-alba lies in the fact that it does not combine chemically with the soda, so as to neutralize the alkali. This was proved by direct experiment. Two pans of biscuit were made with equal quantities of flour and equal weights of pure bi-carbonate of sodium. To the one was added the usual amount of cream of tartar from a sample giving ninety-seven per cent terra-alba; the other was mixed with the soda alone, without any cream of tartar or substitute for it. Both were placed at the same time in the same oven, and when baked it was difficult to distinguish between them. Both were reasonably light, the heat of the oven being sufficient to set free the carbonic-acid gas. Both were of a fine golden yellow, and both were strongly alkaline.

Baking-powder, even though made with alum, is much to be preferred to such cream of tartar, for the alum does enter into chemical combination with the soda, and the alumina resulting from the change is as inert and harmless as so much clay; the sulphate of soda also formed is not excessively injurious.

Of baking-powders, thirty-three samples have been tested: eight of these were in bulk, twenty-five in packages, representing as many different makers.

Of the thirty-three samples, twenty-four were good; that is, they contained nothing injurious, the worst adulteration being an excess of flour or starch over that needed for the mixing of the cream of tartar and soda. The solutions in water were either neutral or slightly acid: hence in the use of these preparations there is no danger of an excess of soda. The twenty-four good samples were well-known and well-tried kinds. Of the remaining nine, eight contained alum, and five of the eight also contained ammonia.

Of the eight samples containing alum, three were in bulk, and five in packages. All but one were purchased in Western Massachusetts: that one was sold in bulk in a country town.

A large excess of starch was found in twelve samples, including the nine which were bad. In several cases the starch amounted to forty-five per cent.

Several samples of salt were tested, also several of vinegar. One of the latter showed chlorine, but the quantity proved to be only one-tenth of one per cent. No lead or other mineral matter was found, and no excess of sulphuric acid.

The question of the adulteration of sirup hardly came within the limits of this report, except as it relates to the presence of tin. Five samples were tested, and no tin or lead was found. There is a trace of iron, derived doubtless from the pans or kettles used in the process of refining. One suspected sirup was examined, which was evidently a manufactured article, but it was free from mineral matter. The ash was only .48 of one per cent.

My thanks are due to Miss Lucia M. Peabody for efficient aid given in the chemical examination of the various substances.

Localities from which Collections were made for Analysis.

	No. of Dealers.	No. Samples Cream of Tartar.	No. Samples Soda.	No. Samples Baking-Powder.	No. Samples Sugar.
Atlantic	1	1	1	–	1
Ayer	4	4	4	1	3
Boston	14	17	4	3	28
Brockton	2	3	3	2	–
Brookline	4	5	2	–	–
Cherry Valley	1	1	1	–	–
Concord	2	2	4	–	–
Danvers	1	1	1	–	–
Deerfield	1	1	2	–	–
Dunstable	1	1	1	–	1
Fall River	10	11	6	1	8
Fitchburg	9	9	–	–	2
Greenfield	2	2	4	2	6
Groton	1	1	1	–	1
Hanson	1	1	1	–	–
Holyoke	1	1	1	–	–
Lawrence	10	12	12	2	1
Leicester	1	1	1	1	–
Lowell	6	6	6	3	2
Lynn	15	17	–	–	–
Natick	1	1	2	–	–
New Bedford	5	5	4	–	8
Newton	1	1	1	–	–
Northampton	4	4	3	7	–
North Wilbraham	1	1	–	–	–
Palmer	1	1	1	1	–
Pepperell	1	1	1	–	1
Pittsfield	5	7	7	6	1
Saugus	1	3	–	–	–
Shrewsbury	1	1	1	–	–
Springfield	3	3	5	–	1
Sudbury	1	1	1	–	–
Taunton	2	2	2	–	2
Three Rivers	1	1	1	–	–
Turner's Falls	1	1	1	–	–
Waltham	2	2	4	2	4
Watertown	1	1	2	–	2
West Brookfield	1	1	1	–	–
West Warren	1	1	1	–	–
Worcester	20	25	–	2	3
Total	141	160	93	33	75