of glucose which can be detected, but also the maximum amount which will be completely destroyed, since presence of undestroyed glucose would obviously render useless any reduction tests for maltose or lactose in the filtrate.

In the experiments upon this point, known amounts of glucose each contained in 5 cc. of water, were treated with 5 cc. of the reagent as above described and after 3½ minutes heating were filtered, the filtration repeated if necessary, until a clear filtrate was obtained and this was then boiled gently for 2 minutes over a free flame. This was repeated with diminishing amounts of glucose until the two minutes boiling of the acid filtrate showed no further reduction, but when such a filtrate was mixed with Fehling's alkaline tartrate solution before boiling a reduction occured indicating incomplete destruction of the glucose by the Barfoed solution. The tests were continued to find how much glucose would be so completely destroyed by the Barfoed solution as here used, that the filtrate would give no evidence of reducing sugar on mixing with alkaline tartrate and boiling for 2 minutes. This amount of glucose was found to be 0.0025 to 0.003 gram. Hence it appears that if the Barfoed test be used as part of a general scheme for sugar mixtures in the manner proposed by Bartley and Mayer, the amount of glucose (or of total monosaccharide calculated as glucose) present in the portion of solutiont ested, should not exceed 2 milligrams for 5 cc. of the acid cupric acetate reagent.

Conclusions.

On account of the difficulty of securing an exact degree of acidity in the cupric acetate solution, each chemist should demonstrate the efficiency of his reagent, as well as verify his manipulation, by check experiments upon known sugar solutions covering the probable range of composition of the unknown solutions to be tested.

As here described the test was efficient for the detection of 0.0004 gram. of glucose, either alone or in the presence of maltose, lactose or sucrose up to 0.02 gram.

Reduction due to disaccharide occurs if too much either of sugar or of acid be present, or if the heating be too prolonged.

In order to effect complete destruction of the glucose, so that the filtrate might be utilized in testing for maltose or lactose, it was necessary to limit the amount to about 0.002 gram of glucose to 5 cc. of the reagent.

It appears that the test requires very careful regulation as to details of manipulation and amount of sugar tested, but under such restrictions is capable of greater usefulness than has generally been appreciated.

A TRIAL OF THE POLARISCOPIC METHOD FOR THE DETERMINATION OF GLIADIN.

By G. W. Shaw.

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as offering a method which would reduce the time required by the ordinary Gunning-Kjeldahl operation, and at the same time be sufficiently accurate for technical purposes.

In connection with a line of cereal investigations now under way at the California Experiment Station the writer recently made some comparative trials of this method against the ordinary procedure. Inasmuch as the range of materials covered in these trials was somewhat different from those mentioned in the original article by Prof. Snyder, the results are set forth below:

Laboratory No.	Gliadin Nitrogen Calculated to Dry Matter. By Polariscope Method.	By Gunning Method.	Difference
19	0.72	—	—
249	0.56	0.54	+. 02
254	0.46	0.49	— .03
257	0.38	0.40	— .02
265	0.42	0.43	— .01
266	0.42	0.44	— .02
268	0.39	0.39	— .00
270	0.38	0.43	— .05
288	0.49	0.49	.00
290	0.57	0.64	— .07
313	0.39	0.55 (?)	— .16
322	0.39	0.53 (?)	— .14
326	0.49	0.50	— .11

The above determinations were made upon soft white wheat meals. In this lot of samples the gliadin determination by the Gunning method had already been made several weeks before the trial of the polariscope method.

Determinations were made by the polariscopic method on the basis of the changed moisture content of the sample, and the results in each case calculated to dry matter for comparison. Further, the methods were operated by different parties, so there were undoubtedly introduced into the operation greater differences in the manipulation of securing solution of the gliadin than if the two operations had been conducted by the same person. Notwithstanding these sources of error it will be noted, that with the exception of Nos. 313 and 322, concerning which there was previouly existing some doubt as to the accuracy of the original determination, the polariscopic method gave results which are within the range of error of most operations.

The above results not being quite satisfactory, the comparison of methods was carried further with the same class of material, the sample operated upon in the one method being taken from the same solution as in the other, one portion being used for polarization and another treated by the Gunning method. The solution of gliadin in these trials was effected by digesting in the cold, as described by Snyder, 15.97 grams of the

material in 100 cc. of 70 per cent. alcohol. The flask was shaken at intervals of half an hour for two hours, and left overnight before filtration. Ten cubic centimeters of this solution were used for treatment by the Gunning method, after first driving off the alcohol by evaporation. By this procedure one would expect somewhat closer results than by the former.

By Polariscope Method.	By Gunning Method.	Difference.
	SOFT WHEATS.	
0.90	0.91	— .01
0.70	.069	+ .01
0.86	0.90	— .04
0.81	0.75	+ .06
0.64	0.63	+ .01
0.70	0.70	.00
0.66	0.69	— .03
0.92	0.94	— 0.2
0.64	0.69	— .05
0.95	0.94	+ .01
0.57	0.59	— .02
0.55	0.60	— .05
0.73	0.71	+ .02
0.62	0.60	+ .02
0.62	0.66	— .04
0.53	0.56	— .03
0.90	0.92	— .02
0.88	0.85	+ .03
0.81	0.78	+ .03
0.70	0.70	.00
0.73	0.74	— .01
0.77	0.78	+ .01
0.62	0.60	+ .02
0.59	0.57	+ .02
0.64	0.60	+ .04
0.64	0.60	+ .04
0.55	0.58	— .03
	Average Difference,	—0.03
	FLOUR.	
0.77	0.75	+ .02
0.59	0.57	+ .02
0.51	0.48	+ .03
0.46	0.43	+ .03
0.62	0.55	+ .07
0.77	0.70	+ .07
0.86	0.84	+ .03
	Average Difference,	+0.04
	DURUM WHEATS.	
0.84	0.83	+ .01
0.77	0.78	— .01
0.95	0.94	+ .01
0.70	0.76	— .06
0.66	0.69	— .03
0.75	0.75	.00
0.79	0.83	— .04
0.59	0.62	— .04
0.81	0.78	+ .03
0.64	0.64	.00
	Average Difference,	—0.02

NOTE: Credit should be given Messrs. E. J. Lea and B. R. Jacobs for the routine work connected with these determinations.

It will be noted that in but three cases out of the forty-five last stated does the difference between the two methods exceed 0.05, which is certainly as close as one can expect ordinary technical work to be done, and as between two samples is undoubtedly within the limits of accuracy of sampling large lots.

A still further test of the method was given by making a gliadin determination upon a gluten flour in which the Kjeldahl method showed 3.32 per cent. of gliadin nitrogen. The polariscopic method showed 3.45 per cent.

Considerable difficulty was experienced at the outset in securing a clean solution for filtration, but this was finally overcome by avoiding excessive agitation.

Snyder remarks that in the case of flours analyzed by him, and probably grown in the middle west, "the combined alcohol soluble carbohydrates and non-gliadin proteins of the alcoholic solution affect the polarization to only a slight extent," and states that after the gliadin protein was precipitated the non-gliadin rotary bodies showed a reading of less than 0.20 on the sugar scale.

In our experience with the method it was always found necessary to make two polarization determinations, the first of the original solution, and the second after separating the protein bodies by the use of a concentrated solution of mercuric nitrate, and then making the required correction to give the true gliadin reading.

This was particularly true in the case of wheat meals where the average difference between the two polariscope readings was 1.05 on the sugar scale corresponding to 0.21 per cent. on the gliadin scale, the range of differences on the sugar scale being from 0.08 to 2.75. In the case of flours, unless extreme accuracy is required, the correction could be neglected inasmuch as the error is much less, not exceeding 0.04 per cent. of the gliadin scale.

The writer is strongly impressed with the idea that the method is worthy of a much more extended use than it has so far had, and that if precautions are taken to correct for the effect of other optically active bodies, there are fewer opportunities for error than with the ordinary method of nitrogen determination.

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THE SOLUBILITY OF STEARIC ACID IN ETHYL ALCOHOL AT ZERO.

By W. H. EMERSON.

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In some work on the determination of stearic acid by the method of Hehner and Mitchell,[1] difficulty was experienced in obtaining a definite

[1] Analyst, 21, 316; also This Journal, 19, 32 (1897) and Lewkowitsch, Oils, Fats and Waxes, 3rd edition, p. 355.