The differences were calculated to per cent. of sugar and compared with the correction for temperature used in specific gravity work, the Brix table for correction for temperature being used. The results show that the temperature correction for the specific gravity and the index of refraction are practically the same and the table as given for Brix can be used for the index of refraction. The manner of using the table is the same. The reading of index of refraction is made at room temperature and this reading calculated to per cent. of sugar, then the proper correction from the table calculated and applied.

In the Brix table for correction for temperature the maximum correction is at a concentration of about 50 per cent. and, as will be seen from the table above, this same fact is noted in the temperature correction for index of refraction.

In conclusion: It appears from this work that the refractometer is a satisfactory instrument for determining the soluble carbohydrates in solution under the same conditions as those under which specific gravity can be used, and in fact it gives the same results; that it has many advantages over the specific gravity method in speed, ease of manipulation and amount of sample required for the determination; that for a great deal of work where quickness and approximate accuracy only are necessary, the refractometer will be used. The butyro-refractometer is of no value for this work as its range of readings does not take in sugar solutions below 50 per cent. of sugar.

THE OPTICAL ROTATION OF GLIADIN IN CERTAIN ORGANIC SOLVENTS.

BY W. E. MATHEWSON.

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THE experiments given here were carried out in connection with an investigation, the object of which was to effect some improvement on the present methods of flour analysis. The work has been interrupted so it has been thought best to publish these results.

The gliadin used was prepared from a bakers' grade hard wheat flour by extracting with 60 per cent. alcohol, filtering the extract until perfectly clear, concentrating and precipitating with absolute alcohol. The crude gliadin thus obtained was again dissolved and precipitated, digested repeatedly with ether and finally dried

over sulphuric acid. All alcohol and ether used had been carefully redistilled. The preparation was soluble to a perfectly clear and almost colorless solution in dilute alcohol. Duplicate portions contained 17.42 per cent. and 17.52 per cent. of nitrogen, determined by the Gunning method, the digestion being continued for two hours after the mixture had become colorless. It was thoroughly mixed during and after the drying so that the nitrogen determinations might be consistent with the polarimetric observations. It is very probable that the proteid was not quite free from moisture; and the specific rotations obtained have been corrected by multiplying by the factor 1766/1747.

The gliadin was soluble in dilute methyl and propyl alcohols, and in glacial acetic acid, phenol, paracresol and benzyl alcohol. A white precipitate, presumably gliadin, was produced when the phenol solution was treated with ether, acetone or pyridine, and somewhat less readily when treated with benzene or chloroform. Pure methyl, ethyl, propyl and amyl alcohols produced precipitates, the amount required being less, the greater the molecular weight of the alcohol. No turbidity followed the addition of several volumes of aniline, phenylhydrazine, or nitrobenzene, but when gliadin was treated with these substances it did not seem to dissolve, and the clear filtrates showed practically no optical activity. It seemed somewhat soluble in benzaldehyde, but the sample of the latter used was not pure.

In order to ascertain whether the gliadin underwent decomposition on dissolving in phenol, about 7 grams were taken, dissolved in about 100 cc. hot phenol and the solution, after cooling, poured into about 500 cc. pure benzene. A heavy precipitate was produced, although the addition of a little of the supernatant liquid to benzene caused a further separation of solid material, showing that a considerable amount still remained dissolved. The liquid was decanted off, the precipitate washed repeatedly with benzene, drained with suction and dried for three weeks over sulphuric acid *in vacuo*. It still retained a faint odor of phenol. Two portions were taken, dissolved in 70 per cent. ethyl alcohol, and the solutions polarized. The latter were not absolutely clear but were sufficiently clear to enable saccharimeter readings to be obtained without difficulty. Ten cc. were taken from the saccharimeter tube and the nitrogen content determined. From this the specific rotation was calculated, assuming

the gliadin to be equal to the nitrogen multiplied by 10000/1766. The following are the data:

Saccharimeter reading, 40° C. 100 mm. tube.	Grams of nitrogen in 100 cc. at 40° C.	$[\alpha]_D^{40°\,C.}$
—4.53° V.	0.3051	—90.95
—5.45° V.	0.3678	—90.76

The specific rotation of the substance seems to have suffered but little change. It gave the biuret reaction and the red-purple coloration with diluted sulphuric acid exactly as does pure gliadin. A solution of gliadin in phenol, giving a saccharimeter reading of —19.7° V (200 mm. tube), was sealed up in a glass bulb and maintained at a temperature of about 140° in an air-bath for three and one-half hours. It then gave a reading of —18.4° V.

The solutions of gliadin in glacial acetic acid and in benzyl alcohol gave precipitates with ether exactly resembling gliadin in appearance, and which dissolved readily in dilute alcohol. These latter solutions gave the biuret reaction.

The specific rotations of the gliadin were obtained with a triple shadow saccharimeter, a jacketed tube being used for the solution. The following are the data:

Solvent.	Grams gliadin per cc. at 40°	Saccharimeter reading in Ventzke degrees.	$[\alpha]_D^{40}$. Degrees.
Methyl alcohol, 70 per cent....	0.03644	—19.81	— 95.3
Methyl alcohol, 70 per cent....	0.03366	—18.42	— 96.0
Ethyl alcohol, 70 per cent.....	0.03085	—16.21	— 92.1
Ethyl alcohol, 70 per cent.....	0.04499	—23.55	— 91.8
Ethyl alcohol, 60 per cent.....	0.02264	—12.52	— 96.9
Ethyl alcohol, 60 per cent.....	0.02388	—13.13	— 96.4
Ethyl alcohol, 60 per cent.....	0.03126	—17.25	— 96.7
Ethyl alcohol, 50 per cent.....	0.02895	—16.29	— 98.6
Ethyl alcohol, 50 per cent	0.04914	—27.55	— 98.3
Propyl alcohol, 60 per cent ...	0.02990	—17.07	—100.9
Propyl alcohol, 60 per cent ...	0.03015	—17.42	—101.3
Phenol, 70 per cent	0.02035	—14.25	—122.7
Phenol, 70 per cent	0.03340	—23.56	—123.6
Phenol, anhydrous.....	0.02824	—21.31	—132.2
Phenol, anhydrous.....	0.03018	—22.73	—132.0
Phenol, anhydrous.....	0.04288	—32.07	—131.1
Paracresol.....	0.02799	—19.54	—121.0
Glacial acetic acid	0.04267	—19.69	— 80.9
Glacial acetic acid	0.05014	—22.48	— 78.6
Benzyl alcohol.....	0.02282	— 6.91	— 53.1
Benzyl alcohol.....	0.03050	—10.14	— 58.3

The methyl and propyl alcohols and the phenol used were the chemically pure grades from well-known manufacturers and were

fractionated before use. The acetic acid and cresol were chemically pure grade but were not further purified. The benzyl alcohol was fractionated. It had a boiling-point of about 202° (uncorrected). The aromatic compounds were tested for optical activity.

The divergence in the results obtained with the benzyl alcohol is doubtless due to the decomposition of a part of the proteid by the heating necessary to bring it into solution. The sample giving the lower reading was purposely kept at a high temperature considerably longer than the other to see if the rotation would be markedly changed. Doubtless the other determinations are also affected with some error due to the same cause, although this was guarded against as far as was practicable.

The fact that gliadin is soluble in phenol would seem to render possible an approximate determination of its molecular weight by the freezing-point method. Since it is also soluble in boiling 70 per cent. propyl alcohol, a determination by the boiling-point method might be made since G. N. Lewis has shown[1] that Raoult's law regarding the elevation of the boiling-point can be applied to a binary solvent whose vapor has the same percentage composition as the liquid. The presence of traces of moisture would affect the results by the latter method much less, although gliadin is doubtless more or less altered by continued warming with any solvent containing water.

An attempt has been made to estimate the gliadin present in flour by digestion with phenol and polarization of the filtered extract. The results obtained seem to indicate that a quite complete extraction of the gliadin is effected. It is possible, however, that more or less glutenin also dissolves in the phenol. The chief difficulty encountered is in the filtration of the mixtures.

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THE SEPARATION OF PROTEOSES AND PEPTONES FROM THE SIMPLER AMINO BODIES.

BY W. D. BIGELOW AND F. C. COOK.

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OF THE methods that have been employed during recent years for the separation of proteoses and peptones from the simpler

[1] This Journal, 28, 766.