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THE CHEMISTRY OF CORN OIL.

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DETERMINATION OF THE CONSTANTS.

THE samples of corn oil, the determination of whose constants has been reported in the present article, are here designated as Nos. I, II, and III.

Oil No. I is a commercial article, bought of a reputable dealer and intended for use in the manufacture of cheap paints. It has been kept in a corked tin can for six to seven years. It is of a bright, golden yellow color, is free from foots, and has a pronounced grain-like odor.

Oil No. II is a sample freshly prepared by hydraulic pressure and is of undoubted purity. Its color is somewhat lighter and its grain-like odor more marked than that of oil No. I.

Oil No. III is a product of the mash of distilleries. It is golden brown in color and from ten to twelve years old. The properties of this oil have been so affected by the process of manufacture that it is practically distinct from the other samples examined. For this reason and because this method of manufacture is now obsolete, its examination was dropped at an early stage.

DETERMINATION OF PHYSICAL CONSTANTS.

A. Specific Gravity.

Both the Sprengel tube and the Westphal balance were used in making this determination, although but little reliance can be placed on the latter beyond the second place of decimals.

Results Obtained:

OIL NO. I.

	Wt. water 15.5° C. Grams.	Wt. oil 15.5° C. Grams.	Wt. oil at 100° C. Grams.	Sp. gr. 15.5° C.	Sp. gr. 100° C.
1	1.5265	1.4068	1.3315	0.9216	0.8722
2	1.6404	1.5113	1.4297	0.9213	0.8715
3	1.3602	1.2528	1.1848	0.9210	0.8710
Average for Sprengel tube				0.9213	0.8716
Westphal balance				0.921	0.895

OIL NO. II.

1	2.0130	1.8547	1.7554	0.92136	0.87203
2	2.1788	2.0072	1.8958	0.92124	0.87011
Average for Sprengel tube				0.9213	0.87107
Westphal balance				0.921	.....

OIL NO. III.[1]

1	1.0037	0.9288	0.8789	0.9253	0.8746
2	1.5718	1.4551	1.3780	0.9257	0.8767
Average for Sprengel tube				0.9255	0.8756
Westphal balance				0.9255	.....

Comparison with Results of Other Observers.

Sp. gr. at 15° C.	Observer.	Reference.
0.8360	Rokitianski[2]	*Ph. Russ.* (1894), 712–713.
0.9160	Curtmann	*Chem. Centrbl.*, **59**, 1193.
0.9170	Bowers[2]	*Pharm. J.*, Nov., 1889.
0.9200	Shuttleworth	*Pharm. J.*, **16**, 1095.
0.9215	Schaedler	*J. Soc. Chem. Ind.*, **11**, 504.
0.9216	Procter	*J. Soc. Chem. Ind.*, **17**, 11.
0.9215–0.9244	De Negri and Fabris	*Ztschr. anal. Chem.*, **33**, 547–72.
0.9220	Trimble	*Am. J. Pharm.*, **58**, 265.
0.9239	Hart[3]	*Chem. Ztg.*, **17**, 1522.
0.9238–0.9262	Hopkins	*This Journal*, Dec., 1898.
0.9243	Dulière	*J. Pharm.* (1897), 217.
0.9244	Smith	*J. Soc. Chem. Ind.*, **11**, 504–5.
0.9245	DeNegri[2]	*Chem. Ztg.*, **22**, 961·976.
0.9262	Mills	*J. Soc. Chem. Ind.*, **11**, 504–5.

[1] Fifteen-year-old sample of oil from mash of distillery.
[2] Petroleum ether extract. [3] Dark brown oil.

B. Viscosity.

This determination was made by means of a Boverton-Redwood viscosimeter and the instrument standardized for both distilled water and rape oil at 20° C.

Results Obtained:

	Temperature.	Av. time of flow. Seconds.	Viscos. water.	Viscos. water.
Distilled water	20°	29	1.00	.....
Rape oil	20°	405.5	....	100.00
Oil No. I	20°	283.7	9.79	70.42
Oil No. II	20°	297.7	10.27	73.89

Comparison with Results of Other Observers:

Temperature.	Viscos. water.	Viscos. rape.	Observer.	Reference.
18° C.–19° C	....	61.1	Smith	*J. Soc. Chem. Ind.*, 11, 504.
15° C.	19.2	...	Andés	"Veg. Fats and Oils."
Viscosity of almond oil			Shuttleworth	*Pharm. J.*, 16, 1095.
Viscosity greater than olive			Bowers	*Pharm. J.*, Nov., 1889.

C. Index of Refraction.

The instrument used for this determination was Abbé's refractometer.

Results Obtained:

	Temperature.	A.	T.
Oil No. I.			
1	15° C.	1.4768	35.8
2	15° C.	1.4766	36.0
3	20° C.	1.4762	35.9
4	20° C.	1.4760	35.9
Average for	15° C.	1.4767	35.9
Average for	20° C.	1.4761	35.9
Oil No. II.			
1	15° C.	1.4765	35.8
2	15° C.	1.4766	36.0
3	15° C.	1.4767	36.0
Average for	15° C.	1.4766	35.9
Oil No. III.			
1	19.5° C.	1.4767	36.2
2	20° C.	1.4766	36.2
3	20.5° C.	1.4764	36.3
Average for	20° C.	1.4765	36.2

Comparison with Results of Other Observers:

Temperature.	Refractive index.	Observer.	Reference.
15° C.	1.4763	Proctor	*J. Soc. Chem. Ind.*, 17, 11.

DETERMINATION OF CHEMICAL CONSTANTS—QUANTITATIVE.

A. Free Acid.

The method given in Allen's "Commercial Organic Analysis," II (I), 104, was used in this determination, substituting a mixture of 9 parts neutral alcohol and 1 part ether for the methylated spirit. The percentage of free acid was calculated to oleic acid.

Results Obtained:

	Wt. oil. Grams.	Vol. N/10 KOH. cc.	Acid value.	Free acid. Per cent.	Degrees acidity.
Oil No. I.					
1	10.6617	7.0	3.68	1.851	6.56
2	7.2552	4.8	3.71	1.851	6.62
Average			3.70	1.851	6.59
Oil No. II.					
1	9.9294	4.0	2.26	1.136	4.03
2	13.0816	5.2	2.23	1.121	3.97
Average			2.25	1.128	4.00
Oil No. III.					
1	4.2351	15.6	20.64	10.387	36.83
2	6.2726	23.1	20.66	10.385	36.83
Average			20.65	10.386	36.83

Comparison with Results of Other Observers:

Free acid. Per cent.	Observer.	Reference.
0.75	Hart	*Chem. Ztg.*, 17, 1522.
0.88	Lloyd	*Chem. Centrbl.*, 59, 257.
0.00	Spüller	Ding. *poly. J.*, 264, 626.
5.63	De Negri	*Chem. Ztg.*, 22, 961-976.

B. Iodine Absorption Hübl Figure.

Necessary Solutions.—

1. $HgCl_2$ in 95 per cent. alcohol, 60 grams per liter.
2. Iodine in 95 per cent. alcohol, 50 grams per liter.

The alcohol used was purified by oxidation with potassium permanganate and subsequent distillation over calcium carbonate. The distillate was rejected until no discoloration was

shown on heating a small portion with a lump of solid potash for ten minutes.

3. N/10 sodium thiosulphate.

4. Twenty per cent. solution of potassium iodide in distilled water.

5. Solution of boiled starch as indicator.

Process.—Thin Erlenmeyer flasks, having accurately fitted ground-glass stoppers and flaring mouths, thus forming a gutter between flask and stopper, were used for this operation.

Equal parts of solutions 1 and 2 were mixed twenty-four hours before each test and allowed to stand in the dark until needed. About 0.250 gram oil was weighed into a test flask, the oil dissolved in 10 cc. chloroform, and 25 cc. of the mixed Hübl solution added. The excess of Hübl solution was afterward found to be about 100 per cent. The flask was then stoppered, the gutter filled with potassium iodide solution, and the whole set away in the dark for twenty-four hours. A blank was run for every determination.

After twenty-four hours the stopper was removed, sufficient potassium iodide solution added to the contents of the flask to prevent any precipitation of mercuric iodide and enough distilled water to make the bulk convenient for titration. The liquid was then titrated with N/10 sodium thiosulphate, starch indicator.

Results Obtained:

OIL NO. I.

	Wt. oil. Gram.	Vol. hypo. cc.	Wt. iodine. Gram.	Iodine absorption. Per cent.
1	0.1986	18.9	0.235323	118.44
2	0.2466	23.7	0.295088	119.66
3	0.2677	26.0	0.323725	120.90
4	0.22835	22.0	0.273921	119.95
Average Hübl figure				119.74

OIL NO. II.

1	0.2708	26.2	0.322183	118.97
2	0.2441	23.3	0.290108	118.85
3	0.2697	25.7	0.319990	118.65
4	0.3070	29.1	0.326232	118.02
Average Hübl figure				118.62

OIL NO. III.

	Wt. oil. Gram.	Vol. hypo. cc.	Wt. iodine. Gram.	Iodine absorption. Per cent.
1	0.2199	20.1	0.250264	113.80
2	0.2894	26.2	0.326215	112.72
3	0.2559	23.4	0.291352	113.85
4	0.2453	22.2	0.276471	112.70
Average Hübl figure				113.27

Comparison with Results of Other Observers:

Hübl figure.	Observer.	Reference.
75.8	Rokitianski	*Ph. Russ.* (1894), 712–713.
111.2–123	De Negri and Fabris	*Ztschr. anal. Chem.*, 33, 547–72.
115.17	De Negri	*Chem. Ztg.*, 22, 961–976.
116.3	Smetham	*Analyst*, 18, 191–193.
117	Hart	*Chem. Ztg.*, 17, 1522.
119.6	Hazura	*Ztschr. angew. Chem.* (1888), 696.
119.4–119.9	Spüller	Ding. *poly. J.*, 264, 626.
121.7–122.7	Lane	*J. Chem. Soc.* (1893), A, 153.
122	Hehner	*J. Soc. Chem. Ind.*, 16, 87.
122	Wallenstein	*Chem. Ztg.* (1894), 18, (ii), 119.
121.5–123.1	Hopkins	This Journal, Dec., 1898.
122.55	Dulière	*J. Pharm.* (1897), 217.
122.9	Mills	*J. Soc. Chem. Ind.*, 11, 504.

C. *Saponification Value (Koettstorfer Figure).*

The method here employed was that given in Allen's "Commercial Organic Analysis," II (I), 56–57. The alcohol employed was prepared as described under "Iodine Values," and a blank run side by side with the test for each determination.

Results Obtained:

OIL NO. I.

	Wt. oil. Grams.	Vol. N/HCl. cc.	Koettstorfer fig.	Sapon. equiv.	Ether value.
1	2.0127	6.95	193.71	289.61	190.01
2	2.5187	8.60	191.55	292.88	187.85
3	2.4600	8.45	192.70	291.13	189.00
Average			192.65	291.21	188.95

OIL NO. II.

1	3.8356	13.20	193.07	290.57	190.82
2	5.2317	18.05	193.55	289.85	191.30
3	2.5611	8.75	191.31	293.24	189.06
Average			192.64	291.22	190.39

OIL NO. III.

1	1.9700	6.75	190.29	294.81	169.64
2	2.2206	7.65	193.26	290.28	172.61
Average			191.78	292.55	171.13

Comparison with Results of Other Observers:

Koettstorfer fig.	Sapon. equiv.	Observer.	Reference.
182.81	306.9	De Negri	*Chem. Ztg.*, **22**, 961–976.
188.1–189.2	298.3–296.6	Spüller	Ding. *poly. J.*, **264**, 626.
188–193	298.4–290.7	De Negri and Fabris	*Ztschr. anal. Chem.*, 33, 547.
189.5	296	Hart	*Chem. Ztg.*, 17, 1522.
193.4	290.07	Mills	*J. Soc. Chem. Ind.*, 11, 504.
198.5	282.6	Smetham	*Anal.*, 18, 191–193.
198.8–203	282.2–276.4	Dulière	*J. Pharm.* (1897), 217.

D. Insoluble Fatty Acids (Hehner Figure).

From 2 to 4 grams of oil were dissolved in ether in a beaker. Fifty cc. of alcoholic potash (made by dissolving about 20 grams potassium hydroxide in 500 cc. purified and redistilled 95 per cent. alcohol) were added to the ethereal solution and the whole heated on a water-bath until saponification was effected. The liquid was then diluted with hot distilled water and heated until the ether and alcohol were entirely expelled. The aqueous soap solution thus formed was broken up with dilute hydrochloric acid and heating continued until the insoluble fatty acids formed a clear oily layer.

The fatty acids were then washed with boiling distilled water until the filtrate was neutral to methyl orange. An unusual amount of washing was found necessary with this oil, owing to the large proportion of an acid difficultly soluble in hot water. About 1500 cc. of wash-water were used and, as will be seen by the results, the amount of insoluble acids found to be unusually low.

Results Obtained:

OIL NO. I.

	Wt. oil taken. Grams.	Wt. insol. fatty acids. Grams.	Hehner value.
1	4.6700	4.3256	92.63
2	2.6092	2.4121	92.45
3	2.3161	2.1609	93.29
Average Hehner value			92.79

OIL NO. II.

1	3.5853	3.2678	91.14
2	3.2331	3.0142	93.23
3	2.6079	2.4079	92.33
Average Hehner value			92.23

OIL NO. III.

	Wt. oil taken. Grams.	Wt. insol. fatty acids. Grams.	Hehner value.
1	3.9832	3.5102	88.12
2	2.8297	2.4995	88.30
Average Hehner value			88.21

Comparison with Results of Other Observers:

Hehner value.	Observer.	Reference.
93.40	Hoppe-Seyler	*Bull. Soc. Chim.* (1866), [2], 6, 342.
93.57	Hopkins	This Journal, Dec., 1898.
94.70	Spüller	Ding. *poly. J.*, 264, 626.
95.70	Hart	*Chem. Ztg.*, 17, 1522.
96.70	Lloyd	*Chem. Centrbl.*, 59, 1193.

E. Volatile Acids (Reichert Figure).

Precisely 2.5 grams oil were saponified as in the Koettstorfer process, evaporating off the alcohol completely. Fifty cc. distilled water, containing 1 cc. phenolphthalein indicator, were then added to the dried soap and the whole heated on the water-bath until the soap was completely dissolved. While still warm the aqueous soap solution was titrated with N/2 sulphuric acid, overrunning 2 cc. The total volume of liquid was now 60–65 cc. The decomposed soap solution was then slowly distilled into a similar flask, containing 50 cc of N/10 potassium hydroxide and 1 cc. phenolphthalein indicator. A large percentage of a solid fatty acid also distilled over in white flakes, but was held back by a small wetted filter, placed in the neck of the receiving flask.

When about 50 cc of the liquid in the distilling flask had gone over, 50 cc. of distilled water were added to the residue and the distillation repeated. The contents of the receiver were then titrated back with N/10 hydrochloric acid and the "Reichert figure" calculated from the amount of volatile acids thus recovered from the two distillations.

Results Obtained:

OIL NO. I.

	Vol. N/10 HCl.	Reichert figure.	Wt. KOH for 100 g. oil. Gram.
1	45.8	4.2	0.94248
2	45.6	4.4	0.98736
Average		4.3	0.96492

OIL NO. II.

1	46.0	4.0	0.89760
2	45.6	4.4	0.98736
Average		4.2	0.94248

OIL NO. III.

	Vol. N/10 HCl.	Reichert figure.	Wt. KOH for 100 g. oil. Grams.
1	39.9	10.1	2.26644
2	40.3	9.7	2.17668
Average		9.9	2.22156

Comparison with Results of Other Observers:

Reichert value.	Observer.	Reference.
0.33	Spüller	Ding. *poly. J.*, **264**, 626.
2.5[1]	Smith	*J. Soc. Chem. Ind.*, 11, 504.
6.7[2]	Morse	*N. H. Expt. Sta. Bull.* (1892), **16**, 19.
0.0	Hopkins	This Journal, Dec., 1898.

F. Acetyl Value.

The method used was that given in Allen's "Commercial Organic Analysis," II (I), 64–65, the "Filtration Process" being the one employed.

Results Obtained:

OIL NO. I.

	Wt. oil. Grams.	Vol. N/HCl. cc.	Koettstorfer fig.	Vol. N/10 KOH. cc.	Acetyl value.
1	2.3420	8.8	210.8	4.5	10.78
2	2.0092	7.6	212.2	4.1	11.45
Average			211.5	..	11.12

OIL NO. II.

1	1.8641	7.1	213.7	3.7	11.14
2	1.4686	5.5	210.1	3.1	11.84
Average			211.9	..	11.49

Comparison with Results of Other Observers:

Koettstorfer fig.	Acetyl value (filtr.).	Observer.	Reference.
201.5	8.25	Lewkowitsch	Allen's "Com. Org. Anal.," Vol. II, 68.
200.9	7.90	Lewkowitsch	Allen's "Com. Org. Anal.," Vol. II, 68.

G. Glycerol.

Hehner's dichromate method, as given in Allen's "Commercial Organic Analysis," II (I), 316–317, was employed for this determination.

Results Obtained:

OIL NO. I.

	Wt. oil. Grams.	Vol. $K_2Cr_2O_7$. cc.	Wt. glycerol. Grams.	Glycerol. Per cent.
1	2.6092	27.57	0.276395	10.59
2	2.3361	24.46	0.245217	10.50
Average				10.545

[1] Calculated. 100 parts oil require 0.56 part KOH.

[2] Calculated. Reported as 3.2 per cent. volatile acids.

OIL NO. II.

	Wt. oil. Grams.	Vol. $K_2Cr_2O_7$. cc.	Wt. glycerol. Grams.	Glycerol. Per cent.
1	2.5701	26.37	0.264359	10.29
2	2.0425	21.21	0.212635	10.41
Average				10.35

H. Phytosterol.

The process of Foster and Reichelmann, as given in the *Analyst* (*1897*), 131, was employed in this determination. The crude phytosterol, resulting from the evaporation of the ethereal extract, was estimated as unsaponifiable matter.

Results Obtained:

	Wt. oil. Grams.	Wt. ether residue. Gram.	Unsap. matter. Per cent.
Oil No. I	55.3945	0.7691	1.39
Oil No. II	49.1123	0.7036	1.43
Average			1.41

Comparison with Results of Other Observers:

Unsap. matter. Per cent.	Observer.	Reference.
1.35	Spüller	Ding. *poly. J.*, 264, 626.
1.55	Hart	*Chem. Ztg.*, 17, 1522.
2.86	Hopkins	This Journal, Dec., 1898.

DETERMINATION OF CHEMICAL CONSTANTS—MISCELLANEOUS.

A. Color Reactions with Sulphuric Acid.

I. Heidenreich's Test.—Two drops concentrated sulphuric acid were allowed to fall into the center of 20 drops of oil on a watch-glass. The oil and acid were then stirred together with a glass rod.

Before stirring, all three oils gave a rayed ring of mahogany-red on golden brown background.

After stirring, oils I and II gave a dark red-brown, while oil III gave a dull claret, all of honey-like consistency.

II. Carbon Disulphide Test.—One drop concentrated sulphuric acid was added to a solution of a few drops of oil in carbon disulphide; the mixture was well shaken and allowed to stand.

All three oils gave a fine violet after twenty-four hours.

B. Color Reactions with Nitric Acid.

I. Hauchecorne's Test.—From 3 to 5 parts oil by volume were shaken with 1 part nitric acid (sp. gr. 1.32). The mixture was then

heated on the water-bath for five minutes and allowed to stand.

Oils I and II gave an orange-yellow oily layer of consistency of thick honey.

Oil III gave a mahogany-red layer of much less viscosity.

II. Massie's Test.—Three parts oil by volume were shaken with 1 part nitric acid (sp. gr. 1.42) for two minutes and allowed to stand.

Oils I and II gave a bright mahogany-red oily layer of great viscosity.

Oil III gave a dark, reddish brown layer of less viscosity.

Comparison with Results of Other Observers:

HNO_3.	H_2SO_4.	Observer.	Reference.
Yellow-orange	.....	Dulière	*J. Pharm.* (1897), 217.
.....	Dark red	Hart	*Chem. Ztg.*, 17, 1522.
Reddish (Massie)	Black-brown	Shuttleworth	*Pharm. J.*, 16, 1095.
Reddish yellow	Green	Brannt	"An. and Veg. Fats and Oils."

C. *Silver Nitrate Reduction Tests.*

I. Becchi's Test—Process of Pearmain and Moor.—Ten cc. of oil were shaken with 2 cc. of a reagent prepared by dissolving 1 gram silver nitrate in 100 cc. 95 per cent. alcohol, then adding 20 cc. ether and 1 drop of nitric acid. The mixture was then placed in boiling water for ten minutes.

All three oils gave a dark brown coloration.

II. Brullé's Test.—Twelve cc. of oil were shaken with 5 cc. of a solution prepared by dissolving 2.5 grams silver nitrate in 100 cc. of 95 per cent. alcohol. The mixture was then heated in boiling water twenty minutes.

All three oils were colored intensely black.

Comparison with Results of Other Observers:

Becchi.	Brullé.	Observer.	Reference.
Slightly darkened	.....	Hart	*Chem. Ztg.*, 17, 1522.
Faint brown	Black	De Negri	*Chem. Ztg.*, 22, 961-976.

D. *Elaidin Reaction (Poutet's Method).*

One cc. of mercury was dissolved in 12 cc. of cold nitric acid (sp. gr. 1.42); 2 cc. of the freshly prepared green solution were added to 50 cc. of oil contained in a wide-mouthed, stoppered bottle, the contents of the bottle violently shaken and the agitation

repeated every ten minutes for two hours. The oil was then allowed to stand undisturbed in a warm room.

Results Obtained.—All three oils.

After two hours, orange-yellow deposit, pasty in consistency and small in amount. Orange-red, viscous liquid above.

After two weeks, little change except in gradual darkening of color and decrease in viscosity of supernatant liquid.

Comparison with Results of Other Observers:

Result of test.	Observer.	Reference.
Pasty or buttery mass	Smith	*J. Soc. Chem. Ind.*, 11, 504.
Orange-yellow color; partial solidification.	Shuttleworth	*Pharm. J.*, 16, 1095.
Orange-yellow; no solidification.	Dulière	*J. Pharm.* (1897), 217.
Much olein; between olive and cotton-seed oils.	Lloyd	*Chem. Centrbl.*, 59, 1193.

E. Rise in Temperature with Sulphuric Acid.

In making this determination, Archbutt's method for the Maumené test, as given in Allen's "Commercial Organic Analysis," II (I), 76–77, was employed. The sulphuric acid used was of 1.842 sp. gr.

Results Obtained:

	Initial temp.	Av. rise in temp.	Specific temp.
Distilled water	23° C.	42° C.	100
Oil No. I	23° C.	75° C.	178.6
Oil No. II	23° C.	74° C.	176.2

Comparison with Results of Other Observers:

Maumené figure.	Observer.	Reference.
56° C.	Spüller	Ding. *poly. J.*, 264, 626.
60.5° C.	Hart	*Chem. Ztg.*, 17, 1522.
79° C.	Jean[1]	*J. Soc. Chem. Ind.*, 11, 504.
84° C.–89° C.	De Negri and Fabris[1]	*Ztschr. anal. Chem.*, 33, 547–72.
89° C.	Mills[2]	*J. Soc. Chem. Ind.*, 11, 504–5.

F. Heat of Bromination.

The process of Hehner and Mitchell, as given in Allen's "Commercial Organic Analysis," II (I), 80, was followed in making this determination. Six readings were taken for each sample. The calculated iodine value was found by multiplying the bromine thermal value by 5.5.

[1] Obtained by use of Jean's thermelaeometer.

[2] 15 grams oil + 5 cc. H_2SO_4.

Results Obtained:

	Br. Therm. Val.	Hübl No.	Calc. I. No.
Oil No. I	21.9° C.	119.74	120.45
Oil No. II	21.8° C.	118.62	119.90

Comparison with Results of Other Observers:

Br. Therm. Val.	Calc. I. No.	Observer.	Reference.
21.5	118.25	Hehner	*J. Soc. Chem. Ind.*, **16**, 87.

G. Solubility in Glacial Acetic Acid (Valenta's Test).

In this determination the method of Allen's "Commercial Organic Analysis," II (I), 40, was followed. Three cc. of oil and of acid were employed.

Results Obtained:

Oil No. I.—74° C., average of six tests.
Oil No. II.—80° C., average of five tests.
Oil No. III.—44° C., average of five tests.

Comparison with Results of Other Observers:

Turbidity temp.	Observer.	Reference.
65° C.	De Negri[1]	*Chem. Ztg.*, **22**, 961–976.

H. Oxygen Absorption (Livache Test).

Finely divided lead powder was obtained by precipitating metallic lead from lead acetate by means of zinc, washing the precipitate rapidly with water, alcohol, and ether, in the order named, and drying it in a desiccator.

Approximately 1 gram of lead powder, prepared as above, was spread in a thin layer on a large watch-glass and a few drops of oil added by means of a pipette, care being taken to keep the drops of oil separate. The amount of oil taken was accurately determined and was not allowed to exceed 0.6 gram. The watch-glass was then exposed to light but protected from dust and allowed to remain, at the ordinary temperature, until it ceased to gain in weight. All samples tested were examined at the same time and under the same conditions.

[1] Obtained by the use of Jean's thermelaeometer.

Results Obtained:

OIL NO. I.

Wt. oil. Gram.	Total gain. Gram.	Time required. Days.	Gain. Per cent.
0.5193	0.0310	7	5.97

OIL NO. II.

0.3313	0.0172	10	5.19

SUMMARY.

TABLE OF PHYSICAL CONSTANTS.

		Oil No. II.	Oil No. I.	Oil No. III.	Insol. fat acids.
Specific gravity.....	15.5° C.	0.9213	0.9213	0.9255	.....
Specific gravity.....	100° C.	0.8711	0.8716	0.8756	0.8529
Viscosity (water)....	20° C.	10.57	9.79	.....	.....
Viscosity (rape)....	20° C.	73.89	70.42	.....	.....
Index of refraction..	15° C.	1.4766	1.4767	.....	.....
Index of refraction..	20° C.	.....	1.4761	1.4765	.....
Melting-point	.....	.....	.....	.....	22.4° C.

TABLE OF CHEMICAL CONSTANTS—QUANTITATIVE.

	Oil No. II.	Oil No. I.	Oil No. III.	Insol. fat acids.
Per cent. ash	.....	0.065	0.0655	.....
Acid value.....	2.25	3.70	20.65	.....
Per cent. free acid	1.128	1.851	10.386	.....
Degrees acidity	4.00	6.59	36.83	.....
Per cent. iodine absorption..	118.62	119.74	113.27	120.98
Koettstorfer figure	192.64	192.65	191.78	199.15
Saponification equivalent....	291.22	291.21	292.35	281.72
Ether value.....	190.39	188.95	171.13	.....
Hehner value.....	92.23	92.79	88.21	.....
Reichert figure.....	4.2	4.3	9.9	.....
Wt. KOH per 100 grams oil..	0.94248 g	0.96492 g	2.22156 g	.....
Koettstorfer of acetic oil.....	211.9	211.5	.....	.....
Acetyl value.....	11.49	11.12	.....	.....
Per cent. glycerol.....	10.35	10.645	.....	.....
Per cent. unsaponifiable matter	1.43	1.39	.....	.....

TABLE OF CHEMICAL CONSTANTS—MISCELLANEOUS.

	Oil No. II.	Oil No. I.	Oil No. III.	Insoluble fat acids.
Heidenreich—H_2SO_4	Mahogany-red to dark red-brown		Mahogany to claret	....
Carbon disulphide—H_2SO_4	Golden brown; violet after 24 hours.		Claret; violet in 24 hours.	....
Hauchecorne—HNO_3	Orange-yellow		Mahogany	....
Massie—HNO_3	Mahogany-red		Dark red-brown	....
Becchi—$AgNO_3$	Dark brown		Dark brown	....
Brullé—$AgNO_3$	Black		Black	....
Elaïdin test	Orange-yellow deposit; red liquid		Orange solid; dark red liquid	....
Maumené—Rise in temp.	74° C.	75° C.	.....	....
Maumené—Specific temp.	176.2	178.6	.....	....
Bromine thermal value	21.8° C.	21.9° C.	.....	21.6° C.
Valenta's test	80° C.	74° C.	65° C.	....
Livache test—Per cent. gain	5.19 in 10 days	5.97 in 7 days.	.....	....