

The fluidextracts of Bayberry, Logwood, Nutgall (U. S. P.) Sumach, Rhatany, White Oak and White Pond Lily and Tinctures of Gambir and Kino are nearly clear or contain only a very slight precipitate. Fluidextracts of Bayberry and Rhatany show no precipitate but they seem to have thickened a little and suggest the gelatinizing process.

Fluidextracts of Blackberry, Chestnut, Jambul, Aqueous Nutgall, Rose, Uva Ursi, Wild Cherry and Witch Hazel have precipitated badly, and in most cases the precipitate has caked together. Fluidextract of Geranium gelatinized after about two years.

Of the nineteen preparations, Tinctures of Gambir and Kino, and Fluidextract of Nutgall are the only ones in which no material change is evident in three years.

Fluidextracts of Bayberry, Blackberry, Chestnut, Jambul, Logwood, Rhatany, Rose, White Oak and White Pond Lily kept well for two years, but signs of deterioration now appear in these, though positive conclusions should not be drawn from the last tests. No positive conclusions are drawn for these preparations.

Fluidextracts of Geranium, Aqueous Nutgall, Sumac, Uva Ursi, Wild Cherry and Witch Hazel show an unmistakable loss of astringency, and mostly within a year. Geranium kept about two years then gelatinized—and it will be noticed that the tests within three months of gelatinizing showed a marked and sudden reduction in tannin. Aqueous Nutgall shows evidence of the tannin rapidly changing to gallic acid.

Wild Cherry loses its astringency quite rapidly; Sumac, Uva Ursi and Witch Hazel more slowly.

Gelatinization does not take place until the tannin is all changed, and a preparation which will gelatinize finally may have lost most of its astringency without changing its physical appearance. Precipitation may occur to a considerable extent without loss of astringency. But the use of strongly alcoholic menstruum for astringent preparations is strongly suggested.

Two fluidextracts of Cinnamon were included (Cassia and Ceylon Cinnamon) in the investigation, but the estimation of tannin in the fresh preparations was so unsatisfactory that definite records could not be obtained. Evidently the tannoid bodies in Cinnamon are not true tannic acid.

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ANETHOL VS. OIL OF ANISE.

OTTO RAUBENHEIMER.

The question whether Liquor Ammonii Anisatus, a much used galenical which is to be admitted into National Formulary IV, should be prepared with anethol or with oil of anise, a question which has caused quite some arguments in our National Formulary Committee, prompts me to bring the same up before the Scientific Section for discussion.

Liquor Ammonii Anisatus, official in most of the foreign pharmacopoeias, is a solution of 1 Gm. anethol or oil of anise in 24 Gm. alcohol with addition of

5 Gm. ammonia water. The latter is of 10 per cent. strength and is not the stronger kind, as has been misinterpreted from the foreign official title liquor ammonii causticus, and to which error the author has called attention on numerous occasions.

OIL OF ANISE.

It is the volatile oil distilled from anise, the fruit of *Pimpinella Anisum*, L. It is thus defined in the seventh decennial revision (1890) of the United States Pharmacopoeia and in the foreign pharmacopoeias. Unfortunately, this definition was changed in United States Pharmacopoeia VIII to also include the oil of star anise, the fruit of *Illicium verum*, Hook-fil. The British Pharmacopoeia is the only other standard which gives the same definition and includes both oils under the same official title *Oleum Anisi*.

The Codex Medicamentarius Gallicus or Pharmacopée Française, 1908, contains two separate monographs under the French titles "Essence d' Anis" and "Essence de Badiane" and the Latin titles "*Oleum Anisi Aethereum*" and "*Oleum Anisi Stellati Aethereum*", respectively.

DIFFERENCE BETWEEN OIL OF ANISE AND OIL OF STAR ANISE.

There is a marked difference between these two oils, and I greatly doubt the advisability of including both under the official title "*Oleum Anisi*".

1. *Difference in Name*.—The oil of anise from *Pimpinella Anisum* is known as Russian oil, because that country is the market for anise seed for the distillation of the oil. The oil of star anise from *Illicium verum* is generally known as Chinese oil of anise, being imported from southern China and Tonkin.

2. *Difference in Chemical Constituents*.—The two anise oils should contain from 80 to 90 per cent. anethol, to which the characteristic anise-like odor and sweet taste are due. Methyl chavicol, a liquid isomer of anethol, having its odor but not its sweet taste, is another constituent. The two together, with traces of oxidation products as anisic aldehyde and anisic acid, are the constituents of the oil from *Pimpinella Anisum*.

Star anise oil also contains the terpenes d-pinene and l-phellandrene and traces of the ethyl ether of hydroquinone. According to Oswald,¹ it also contains safrol, while Tardy² states that it contains terpineol, a laevorotatory sesquiterpene, and a body melting at 213° C.

In order to corroborate these statements, and in view of the knowledge which has been gained in the chemistry of terpenes in recent years, Schimmel & Co. have made a thorough investigation,³ and report that star anise oil, in addition to its previously known constituents, also contains: p-cymene, cineol, safrol and terpineol. The phellandrene present was found to be a mixture of l-, a-, and b-phellandrene.

3. *Difference in Physical Characteristics*.—Oil of star anise generally has a

¹Archiv. der Pharmazie, Vol. 229 (1891), 95.

²These pour l'obtention du diplôme de Docteur de l'Université de Paris (1902), abst. Schimmel's Report, October, 1902, 79.

³Schimmel's Report, April, 1910, 99-101.

lower solidification point than the Russian oil, a fact which was also recognized in the resolutions of the second international Congress of the White Cross Association for suppressing the adulteration of food stuffs, chemical products and drugs, held in Paris, October, 1909.

Oil of star anise is sometimes slightly dextrorotatory,⁴ while the Russian oil always has a rotation to the left. But the principal difference lies in the odor and taste, as the oil of star anise never has the sweet anise odor and taste of the Russian oil, and for that reason it is distinctly inferior. The French Codex in the description of Essence d'anis states "saveur sucré," which property, however, is not mentioned under Essence de Badiane.

4. *Difference in Price.*—The Russian oil is always more expensive. I find it quoted at \$2 per pound, while the Chinese oil is quoted at only \$1.40.

Besides these differences, there are two more facts to be taken into consideration:

a. *Adulteration and Sophistication of Oil of Star Anise.*—This oil, being imported from China or Tonkin, is very prone to be adulterated. Lately the English chemists and authorities on essential oils—Parry,⁵ Ummey⁶ and Jensen⁷—reported that Chinese oils of low specific gravity and low congealing point were adulterated with some fraction of camphor oil. Evans Sons, Lescher and Webb, Lim.,⁸ have reported the same. Schimmel & Co.⁹ find that a low specific gravity and low solidification are due to the abstraction of anethol.

Japanese oil of star anise, which is distilled from the leaves, contains only 25 per cent. anethol, besides terpenes, eugenol and safrol.

b. *Substitution of Oil of Star Anise for Oil of Anise.*—This is undoubtedly very common. The similarity in name, the difference in price, and last, but not least, the unfortunate fact that both are official in United States Pharmacopoeia VIII under the same title, are responsible for this substitution.

The National Standard Dispensatory, 1905, states on page 1058: "The substitution of star anise oil for anise oil is not regarded as adulteration. Fair dealing, however, demands that both oils be sold under their proper label." Our National Formulary, and even its forerunner, the New York and Brooklyn Formulary, makes the following statement under Elixir of Anise, which statement still holds good today: "Oil of star anise, which is usually supplied by dealers when oil of anise without specification is ordered, does not answer well for the preparation of aniseed cordial."

From these remarks it can be readily understood that we are greatly in need of a uniform body in place of the variable oil of anise in the market. And we have the same in anethol, the stearopten or oxygenated constituent of oil of

⁴Schimmel's Report, April, 1908, 139.

⁵Chemist and Druggist 77 (1910), 687.

⁶Perfumery and Essential Oil Record 1 (1910), 236.

⁷Pharmaceutical Journal 85 (1910), 759.

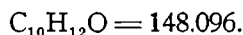
⁸Analytical Notes, 1910, 9.

⁹Report, April, 1911, 108-110.

anise. Our committee on stands of unofficial drugs and chemical products under the chairmanship of George M. Beringer, has prepared the following description, standards and tests:

ANETHOLUM.

Anethol.



The methyl ether of para-propenyl-phenol, C_3H_5 (1) $C_6H_4OCH_3$ (4), constituting the main constituents in oil of anise, star anise and fennel and obtained by fractioning, chilling and crystallizing. It should be kept in well stoppered, amber-colored bottles, protected from light and air.

At ordinary temperature anethol is a colorless or faintly yellow, highly refractive liquid, having a sweet taste and the aromatic odor of anise. At $+21$ to $+22^\circ$ C. it solidifies to a white glistening, crystalline mass, which remelts at 22° to 23° C. Specific gravity 0.984 to 0.986 at 25° C. Boiling point 232° to 234° C. Its refraction index is 1.56 at 20° C. It should be optically inactive, or show a deviation of not over 0.08° in 100 mm. tube at 25° C., due to slight traces of the oil from which the anethol has been prepared (if from anise oil this deviation will be lævogyrate, if from fennel oil dextrogyrate).

Anethol is almost insoluble in water, readibly soluble in ether or chloroform, and makes a clear solution with two volumes of alcohol or two to three volumes of 90 per cent. alcohol at 20° C. 10 Cc. of anethol shaken with 50 Cc. of saturated solution of sodium bisulphite in a graduated cylinder and allowed to stand for six hours should show no appreciable diminution in its volume nor should a crystalline deposit separate (absence of aldehydes).

What an important role anethol plays in other countries is well illustrated by the fact that it has been admitted into the following pharmacopoeias:

Deutsches Arzneibuch, IV ed., 1900;
 Pharmacop. Nederlandica, IV ed., 1905;
 Pharmacop. Japonica, III ed., 1905;
 Pharmacop. Austriaca, VIII ed., 1906;
 Pharmacop. Belgica, III ed., 1906;
 Pharmacop. Suecica, IX ed., 1908; and also in the
 British Pharmaceutical Codex, 1907.

The Swedish Pharmacopoeia even goes so far as making the official statement that anethol is to be dispensed in lieu of anise oil and fennel oil.

It is consequently not surprising to notice the following remarks in Schimmel's Report of April, 1907, p. 12:

"The use of oil of anise is distinctly falling off, since in anethol there is placed a product at the disposal of the consumers, the use of which in view of the *purser taste* and *greater richness* offers advantages which no one can gainsay."

While anethol seems to be quite well known, and also used in the eastern and middle sections of the United States, the discussions in our National Formulary Committee have brought out the statement that this is not the case in the western part. This is rather surprising, inasmuch, as anethol has been one of the ingredients in elixir anisi ever since the first issue of the National Formulary in

1888. The following note, which is contained in the three editions of the National Formulary, calls special attention to it:

“Anethol is the stearopten of oil of anise, and possesses a finer and purer aroma and taste than any commercial variety of oil of anise.”

As has been stated, the German Pharmacopoeia IV made anethol official in 1900 and, strange to say, under the Latin title “Oleum Anisi” and the German title “Anethol”. The late Belgian Pharmacopoeia gives the synonym “Essentia Anisi” under the official title “Anetholum”. It goes without saying that this vice versa statement in the two standards is not correct, because anise oil and anethol are not identical, although the Russian oil now is of much better quality and has a larger anethol content than in former years. Strange to say, the fifth edition of the Arzneibuch has deleted anethol and also carvone and eugenol, and has admitted the corresponding oils in place thereof. This step, namely, the resurrection of the variable essential oils in place of their uniform active constituents, is much to be regretted, and is contrary to the policy adopted by the other Pharmacopoeias, namely to admit only the *very best*.

ADVANTAGES OF ANETHOL OVER OIL OF ANISE.

1. It is of distinct chemical composition and can be obtained practically 100 per cent. pure, while the different anise oils vary greatly in their anethol content.
2. It is always of uniform character and is the same in every case, while anise oils differ greatly, physically and chemically, according to their origin.
3. Anethol can be tested more readily and more stringently as to its quality, purity and strength.
4. It is of greater solubility, being soluble in two volumes of alcohol, while some oils of anise require five to six volumes.
5. Anethol possesses a sweeter taste and a more aromatic odor than even the very best oil of anise.
6. Anethol is also to be preferred from a therapeutic point, as it constitutes that portion of oil of anise which is the most valuable medicinally.
7. Last, but not least, its price is reasonable in proportion to its strength, and some manufacturers claim it is twice as strong as the oil. The same price list quotes the Chinese oil at \$1.40, the Russian at \$2, and anethol at \$2.40.

As this question of anethol vs. oil of anise has arisen in connection with its use in liquor ammonii anisatus, I might also state the formula of the latter which has been proposed for the National Formulary IV under the title of

SPIRITUS AMMONII ANISATUS.

Anisated Spirit of Ammonia.

Anethol	30 Cc.	
Alcohol	820 Cc.	
Ammonia Water	150 Cc.	
	1000 Cc.	
To make		1000 Cc.

The advantages of Anethol in Spiritus Ammonii Anisatus, according to my experience, and I have prepared this galenic in large quantities for a great many years, are as follows:

1. Anethol produces a clear solution, while some of the anise oils give a turbid or cloudy spirit, which forms a precipitate.

2. Anethol produces a colorless preparation, while most of the anise oils turn the spirit yellow.

I hope that this question will be well discussed by the members of the Scientific Section, and I trust that my arguments presented will be so convincing that the uniform anethol will supersede the variable oils of anise in National Formulary, and perhaps also in United States Pharmacopoeial preparations.

AN EXAMINATION OF SOME COMMERCIAL SAMPLES OF ANETHOL.

GEORGE M. BERINGER.

In connection with the work of the Committee on Unofficial Standards, it was decided to prepare a standard for Anethol, and an examination of at least several commercial samples thus became necessary.

The authorities are fairly closely agreed upon the description and tests for this article. The Ph. Germanica IV, in which it was official as Oleum Anisi, gave its melting point at $+20$ to $+21^{\circ}$; the specific gravity at 25° C. 0.984 to 0.986; the boiling point 232° to 234° C., and soluble in two parts of alcohol. The Austrian Pharmacopoeia similarly states the melting point $+20$ to $+21^{\circ}$ C.; specific gravity 0.984 to 0.986; boiling point 232° to 234° . Parry, Chemistry of Essential Oils, gives melting point 21° ; boiling point 232° . Gildemeister and Hoffman, The Volatile Oils, melting point 21° ; boiling point 233° to 233.5° ; specific gravity at 25° C. 0.986. Allen, Commercial Organic Analysis, states "freshly prepared pure anethol congeals at about 21° C. and re-melts at 22.5 to 22.7° C. It is optically inactive. It undergoes oxidation on keeping." Schmidt, Pharmaceutische Chemie, states "melting point $+21$ to $+22^{\circ}$ C.; boiling point 233° ; specific gravity at 25° as 0.985." This author also "directs attention to the fact that from long keeping in the liquid state or exposure to air, Anethol changes, and then its congealing point may be reduced to even below 0° ."

While the Anethol of the European pharmacopoeias is presumably that obtained from Oil of Anise, it is the main constituent in oils of anise, star anise and fennel and may commercially be prepared from either of these. The oil of star anise probably furnishes the bulk of that in the American market. The physical characters must vary slightly with the source from which the anethol is obtained, due to slight adhering traces of the other constituents of the oil used. Within narrow limitations these affect the congealing, melting and boiling points and the specific gravity. While chemically pure Anethol is optically inactive, the commercial might show a slight dextro rotation if prepared from oil of fennel or a