

SUMMARY.

Percolation tests show that within the limits of No. 20 and No. 80 powder, the fineness of powder is of minor importance in the extraction of jalap.

The N. F. VI menstruum for Resin of Jalap (alcohol 9 volumes—water 1 volume) has no advantage over the menstruum of the U. S. P. X (alcohol) from the standpoint of rate of extraction, purity and yield of resin. The N. F. VI menstruum has the disadvantage of causing a great increase in total extracted matter, thus increasing the bulk of syrupy extract to be handled and greatly increasing the proportion of impurities to be removed during the precipitation and washing of the resin.

Comparative results on the assay of resin of jalap by several assay methods are presented.

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A STUDY OF PRECIPITATION IN FLUIDEXTRACT OF SENNA I.*¹

A COMPARATIVE STUDY OF PRECIPITATION IN THE OFFICIAL FLUIDEXTRACTS OF SENNA.

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INTRODUCTION.

Most fluidextracts may be filtered, or decanted, and bottled for the trade within a rather short period of time after they have been made. A few of them, however, continue to sediment over long periods of time, yielding unsightly preparations. Among them is the official fluidextract of senna.

This investigation has been made with the view to finding ways of preventing, or hastening, the completion of sedimentation in fluidextract of senna. A study of the merits of various menstruums has been made together with other factors bearing upon the subject.

HISTORICAL.

Fluidextract of senna was first official in the U. S. Pharmacopœia of 1860 and has been retained in each revision since then. In spite of its unsightly appearance, it has remained official because of its wide use as a valuable medicinal agent.

Soon after their introduction into the Pharmacopœia, fluidextracts became the objects of criticism and study. From the point of view of elegant preparations, many of them are unsatisfactory, even to-day, because of their continued precipitation.

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¹ Based upon a thesis submitted to the Faculty of Purdue University by Karl L. Kaufman in partial fulfillment of the requirements for the Degree of Doctor of Philosophy.

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Maisch (1859) and Thayer (1859) recommended the use of sugar, and menstruums high in alcoholic content, as general means of reducing the precipitation in fluidextracts. Groves (1868) examined the precipitates in old samples of Liquor Sennæ and found sulfates, phosphates, calcium, and resinous acids present. He believed that the acids originated from the slow decomposition of an unstable glucoside.

Lloyd (1881, *et seq.*), in a series of papers, discussed the problem of precipitation in fluidextracts.

Tschirch and Hiepe (1901), in studying the deposit in senna infusions, obtained a yellowish substance to which they assigned the formula $C_{14}H_{10}O_6$. Tutin (1913) was unable to obtain the product which Tschirch and Hiepe had described, but believed it to be a mixture of rhein and aloemodin. Such a mixture, in about equal proportions, should have the properties ascribed to the substance having the formula, $C_{14}H_{10}O_6$.

Plenderlieth (1911) found the precipitate in senna infusions to be composed of two microcrystalline forms. One was the yellow substance which had been described by Tschirch and Hiepe. The other was calcium tartrate. Wallis (1913) extended Plenderlieth's work and proved that calcium tartrate did not exist preformed in senna leaves. He also showed that the precipitate was not due to enzyme action, or oxidation.

Broeksmit (1916) suggested that the infusion of senna, of the Holland Pharmacopœia, be stabilized by precipitating the calcium salts with magnesium sulfate, and filtering off the calcium sulfate.

Scoville (1927) found that a fifty per cent tincture of senna, which contained sufficient sodium acetate to saturate its water content, did not precipitate for a period of eight weeks. He did not explain his observations, but recommended the use of glycerolic menstruums.

Zanotti (1929) claimed that the precipitate in fluidextract of senna contained the active principles of the drug. He based his claims upon the fact that it gave positive Borntraeger reactions.

A STUDY OF THE OFFICIAL FLUIDEXTRACTS OF SENNA. MEASURING THE SEDIMENT.

The fluidextracts which we prepared for this study were made from a batch of Alexandria senna, supplied to us by the Eli Lilly and Company. It conformed to the official tests for identity and purity.

Precipitates which form in fluidextracts of senna are amorphous, and dark in color. They do not always settle compactly, and for that reason cannot be photographed. It was necessary, therefore, to resort to some arbitrary means of indicating the relative amounts of sediments which formed in the various samples. This has been done by means of plus (+) signs. Their significance is as follows:

+ about 1 mm. of deposit
 ++ about 3 mm. of deposit
 +++ about 5 mm. of deposit
 ++++ about 7 mm. of deposit
 +++++ about 9 mm. of deposit

A COMPARISON OF THE OFFICIAL FORMULAS.

The official fluidextracts of senna, including those of the U. S. Pharmacopœias IV to X, were prepared and observed for precipitation, at intervals, over a period of many months, in most cases for more than a year. Our observations are recorded in Table I. The ages of the fluidextracts are expressed in days and the amounts of the precipitates in the arbitrary manner as previously explained.

It will be observed that the U. S. P. VII fluidextract precipitated much more slowly than the other formulas for a time, but after about a year it was as unsightly as the others.

TABLE I.

U. S. P. IV. Age in Days.	Pre- cipi- tate.	U. S. P. V. Age in Days.	Pre- cipi- tate.	U. S. P. VI. Age in Days.	Pre- cipi- tate.	U. S. P. VII. Age in Days.	Pre- cipi- tate.	U. S. P. VIII. Age in Days.	Pre- cipi- tate.	U. S. P. IX. Age in Days.	Pre- cipi- tate.	U. S. P. X. Age in Days.	Pre- cipi- tate.
10	+	10	+	20	+	8	+	15	+	12	+	8	+
25	++	25	++	40	+++	20	+	35	+	25	+	20	+
70	++++	73	++	55	+++	36	+	50	++	47	+++	51	++
97	++++	100	+++	100	++++	61	+	95	+++	82	+++	61	++++
134	++++	134	+++	127	++++	83	++	122	+++	127	+++	83	+++
216	++++	216	++++	161	++++	103	++	156	+++	153	++++	103	++++
355	++++	365	++++	244	++++	300	++++	238	++++	269	++++	300	++++
.....	383	++++	439	++++	377	++++	408	++++	439	++++	.....	.....

¹ Precipitate shows in rather distinct layers.

² A chunky precipitate deposited on the walls.

HYDROGEN-ION CONCENTRATION.

In an effort to find a clue to the cause of prolonged precipitation in fluidextract of senna, a series of p_H readings were taken upon all the official preparations. The age of the fluidextract, at which the p_H was taken, is expressed in days. The readings are given in Table II.

It will be observed that the increase in p_H in these preparations is rather gradual for the first few months. Furthermore, those which were about two years old showed decided increases in p_H .

Inasmuch as these measurements were made with a potentiometer, using a saturated calomel-quinhydrone electrode, they represent at best only relative values. These, however, are significant and deserving of further study.

TABLE II.

U. S. P. IV. Age. ¹	p_H . ²	U. S. P. V. Age.	p_H .	U. S. P. VI. Age.	p_H .	U. S. P. VII. Age.	p_H .	U. S. P. VIII. Age.	p_H .	U. S. P. IX. Age.	p_H .	U. S. P. X. Age.	p_H .
10	5.40	10	5.53	8	5.45	35	5.42	14	5.66	20	5.24	40	5.15
21	5.42	21	6.28	19	5.45	53	5.46	34	5.70	45	5.37	61	5.30
41	5.49	41	6.18	30	5.57	74	5.62	45	5.82	66	6.00	82	5.25
68	5.47	68	5.83	71	5.63	105	5.79	65	5.79	97	5.69	102	5.35
95	5.41	95	5.89	156	5.85	850	9.00	150	6.10	842	7.69	133	5.30
123	5.32	123	5.66	816	8.43	...	...	810	9.00	...	...	...	...
786	7.18	786	8.23	...	...	...	...	...	...	...	...	...	...

(1) Age is given in days.

(2) p_H values measured at 23° C.

THE SEDIMENTATION PERIOD FOR FLUIDEXTRACT OF SENNA.

It has been said that the usual period allowed for sedimentation in fluidextracts is thirty days. Since fluidextract of senna behaves so badly it was thought that a period, longer than thirty days should be allowed for it. In an effort to settle this question the following study was made.

A liter of the official fluidextract of senna was prepared, filtered, and divided into four parts. One portion served as a control, while the other three were filtered at 30, 60 and 90 day intervals, respectively. Frequent observations were made upon these four samples in order to make a comparative study of their precipitants. Our observations may be briefly stated as follows:

1. At the end of a year no differences could be observed in the amount and character of the sediment in each of the four samples.

2. These studies were made many times upon commercial and laboratory samples. A commercial sample which was more than two years old continued to form a sediment after being filtered.

From these observations, we are led to believe that precipitation in fluidextract of senna is due to a slow chemical change, the cause of which is undetermined.

SUMMARY.

1. The literature upon precipitation in senna preparations has been briefly reviewed.

2. A comparative study of sedimentation in the official fluidextracts of senna has been reported.

3. It has been shown that fluidextract of senna continues to precipitate over long periods of time. The practice of allowing fluidextracts to stand for thirty days before being filtered and bottled for the trade is inadequate for fluidextract of senna.

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TASTE TESTS. IV. RELATIVE BITTERNESS.*

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Previous taste studies have led to the development of a standard method of taste evaluation (1, 2, 3, 4) which has been used in studies on strychnine (5). Tastes, for the purpose of our investigation, have been (arbitrarily) sub-divided into four groups: bitter, sour, sweet and salt. This report deals with the results obtained in studies of relative bitterness. After rinsing the mouth with distilled water, one or two cc. of test solution was placed in the mouth and held there for exactly one minute. The solution was then ejected, and the mouth rinsed with distilled water. An interval of 15 to 30 minutes elapsed between each test. In general, solutions were tasted which were obviously more bitter than the threshold, then the successive dilutions tried until a dilution had been reached which did not appear to have a bitter taste. In successive tests on subsequent days, solutions

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