

## A STUDY OF TINCTURE OF CAPSICUM.\*

BY CHARLES F. POE, ARTHUR P. WYSS AND B. S. SLATOR.

Tincture of Capsicum is an alcoholic preparation of the drug *Capsicum frutescens*, of the Solanaceæ family, and is official in the United States and British pharmacopœias. The British preparation has a strength of only five per cent, while the one listed in the United States Pharmacopœia is ten per cent. The alcoholic strength of the menstruum for the official tincture is of unusual proportions, being nineteen volumes of alcohol to one volume of water, or about ninety per cent alcohol by volume. The reason for this, as stated by the United States Dispensatory (1), is that the oleoresinous constituents of capsicum require alcohol as a solvent, and, on the other hand, a small amount of a constituent soluble in water and insoluble in alcohol, requires a little water so as to prevent cloudiness. A tincture may also be prepared by using a menstruum of a lower percentage of alcohol than that which is called for in the Pharmacopœia, and such a preparation would naturally differ in its constituents from the official product.

The purpose of this investigation was to study the composition of different tinctures of capsicum prepared from unrelated samples of the crude drug, using several percentages of alcohol for the menstrua. In this way it was thought that valuable information might be obtained which would aid in the detection of adulteration, after an analysis for the various constituents had been made.

Tinctures were prepared from eight different samples of capsicum, each of which conformed to the United States Pharmacopœial standards of quality and purity. These tinctures were prepared by the type process of percolation indicated by the tenth revision of the Pharmacopœia with the exception of varying the strengths of alcohol used. The tincture of low percentages of alcohol were cloudy at first, and for this reason they were allowed to stand until the precipitate had settled and then filtered. The samples were then examined by procedures which are essentially those given for food products by the A. O. A. C. Methods of Analysis (2). The determinations made were as follows: Specific gravity, alcohol, total solids, water-soluble solids, alcohol-soluble solids and ether-soluble

TABLE I.—TYPICAL ANALYSIS OF SERIES OF TINCTURES MADE WITH DIFFERENT STRENGTHS OF ALCOHOL.

Per cent of alcohol used (by vol.).	Specific gravity of the tincture.	Per cent of alcohol found in tincture (by vol.).	Total solids per cent in tincture.	Water-Soluble Solids.		Alcohol-Soluble Solids.		Ether-Soluble Solids.	
				Per cent in tincture.	Per cent in solids.	Per cent in tincture.	Per cent in solids.	Per cent in tincture.	Per cent in solids.
00.00	1.01093	00.00	2.49	2.36	94.75	0.577	23.17	0.020	0.803
11.32	0.99719	9.34	2.50	2.34	93.60	0.610	24.40	0.024	0.960
20.38	0.98973	16.21	2.50	2.30	92.00	0.692	27.24	0.018	0.708
29.51	0.98065	25.80	2.43	2.25	92.59	0.720	29.68	0.017	0.700
39.09	0.96759	35.26	2.41	2.16	89.62	0.725	30.08	0.018	0.746
50.04	0.94665	45.65	2.44	2.15	88.11	0.781	32.00	0.090	3.64
60.48	0.92532	53.50	2.85	2.12	74.39	0.982	34.62	0.490	17.19
70.02	0.89921	64.68	2.81	1.90	67.61	1.46	51.94	0.718	25.55
80.17	0.87091	74.60	2.77	1.46	52.70	1.83	66.06	1.090	39.34
91.07	0.83505	84.58	2.55	0.93	36.47	2.18	85.49	1.649	64.66
95.39	0.81778	90.44	2.27	0.46	20.26	2.10	92.51	1.855	81.71

\* Scientific Section, A. PH. A., Rapid City meeting, 1929.

solids. The results, obtained for one of the typical series of tinctures analyzed, are recorded in Table I.

The analyses of the different samples gave results which were very similar for the corresponding tinctures made from different samples of capsicum. For the sake of comparison the samples were averaged, and the results are given graphically in Plates I and II. Plate I gives the actual percentages of solids found plotted against the percentages of alcohol used. Plate II shows the percentages of different kinds of solids found in the total-solids.

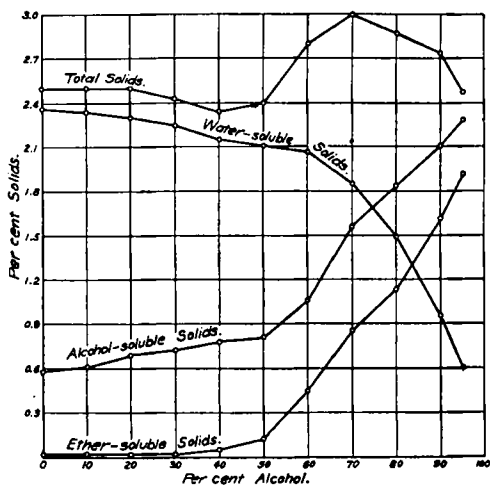


Plate I.

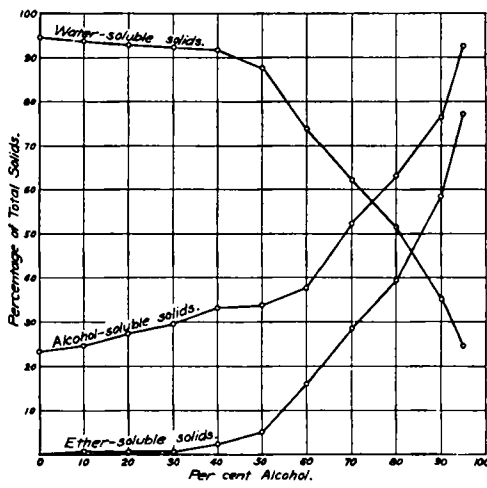


Plate II.

From the results plotted in Plate I it may be seen that the total solids show a slight but gradual reduction until 40% alcohol was used. From this point they increase very rapidly to the point where 70% alcohol was used and then decrease as the alcoholic content increased. The water-soluble solids decrease slightly, in general, up to and including the samples made with 60% alcohol. The decrease from this point up to 95% is very rapid. The difference in the water-soluble solids, for the tinctures made from the 40, 50 and 60% alcoholic menstrea, in all of the samples vary very little. As would be expected the alcohol- and ether-soluble solids increase as the percentage of alcohol in the menstruum increases.

Probably the most important ingredients of tincture of capsicum are those which are soluble in strong alcohol, and consist chiefly of the oleoresins. Tinctures which have a high percentage of total solids are not necessarily of the best quality. Those, however, which have the highest ether- and alcohol-soluble solids should be considered the most valuable.

Plate II presents about the same conclusions as does Plate I. The percentage of water-soluble solids in the total solids shows a decrease as the alcohol in the menstruum increases. The curves for both the alcohol-soluble solids and the ether-soluble solids in the total solids increase as the strength of the menstruum increases. The curve for the latter, however, shows a more marked increase for each ten per cent increase in the alcoholic content of the menstruum, especially between 40 and 95%. For this reason the percentage of the ether-soluble solids in the total solids might afford a slightly better index of quality.

It sometimes happens that tincture of capsicum is prepared from the oleoresin. Several samples of capsicum were mixed and an official oleoresin was prepared. This was used to prepare a tincture of capsicum. The analysis for this tincture is given in Table II. From the table it will be noted that the analysis is somewhat similar to that obtained for the official tinctures. However, the percentage of water-soluble solids in the total solids is much lower, and the percentages of alcohol-soluble solids and ether-soluble solids in the total solids are somewhat higher.

TABLE II.—ANALYSIS OF TINCTURE MADE FROM THE OLEORESIN.

Per cent alcohol used (by vol.)	95.39	Alcohol-soluble solids	
Specific gravity of tincture	0.81689	Per cent in tincture	1.94
Per cent alcohol found (by vol.)	89.20	Per cent in solids	97.77
Total solids, per cent in tincture	1.97	Ether-soluble solids	
Water-soluble solids		Per cent in tincture	1.90
Per cent in tincture	0.095	Per cent in solids	96.66
Per cent in solids	4.78		

## CONCLUSIONS.

1. An official tincture of capsicum prepared according to the Pharmacopœia should contain a high percentage of ether- and alcohol-soluble solids and a low percentage of water-soluble solids in the total solids.

2. A tincture having a low percentage of ether- and alcohol-soluble solids, and a high percentage of water-soluble solids in the total solids indicates that it has been made with diluted alcohol as a menstruum.

3. A tincture whose percentage of ether- and alcohol-soluble solids in the total solids are both low as well as the total solids, indicates that it has been made from a drug whose oleoresins have been wholly or partly removed.

4. A tincture with a rather high percentage of ether- and alcohol-soluble solids and a low percentage of water-soluble solids in the total solids, indicates a tincture made from an oleoresin. The percentage total solids will also be somewhat low.

5. If the percentage of total solids is low and the percentages of other solids in the total solids are normal, then the tincture has been prepared by using too little drug, or one adulterated with inert material.

6. In general an official tincture of capsicum will meet the following requirements:

- a. Not more than 40% of total solids soluble in water. (Average 34.88%.)
- b. Not less than 70% of the total solids soluble in alcohol. (Average 77.04%.)
- c. Not less than 50% of the total solids soluble in ether. (Average 58.51%.)
- d. The total solids should not be less than 2.5%. (Average 2.75%.)

The above figures are based on a somewhat limited number of samples. Additional analyses should be made to confirm these findings.

## REFERENCES.

- (1) "United States Dispensatory," 21st Edition, Wood and LaWall.
- (2) Methods of Analysis, Assoc. Official Agric. Chemists, 2nd Edition.

STATE FOOD AND DRUG LABORATORY AND DEPARTMENT OF CHEMISTRY,  
COLLEGE OF PHARMACY, UNIVERSITY OF COLORADO, BOULDER.