In the experiments on the excised frog's eye the action of benzyl alcohol is more rapidly evidenced than that of chloretone and brometone but is not as great as either of these substances though its action is in general greater than one-half that of chloretone.

From the comparative data obtained in all the tests it seems fair to conclude that chloretone is fully twice as active as benzyl alcohol and that its effect is more lasting. Also, that brometone is about as active as chloretone though somewhat handicapped by being much less soluble.

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TINCTURE OF GINGER.

BY JOHN R. RANDOLPH AND GEORGE M. BERINGER.

The experiments described in this paper were undertaken primarily in behalf of the pharmacopœial revision. The purpose was to determine the extent of the extraction of the ginger obtained by preparing tinctures with menstrua of different proportions of alcohol and the possibility of reducing the alcoholic percentage in the official formula. Also the feasibility of adopting for the U. S. P. the so-called "double strength" tincture prescribed by Treasury Decision No. 3092. Further, what should be the proper requirements for the standard preparation to be specified in the formula adopted for the U. S. P. X.

J. P. Snyder (*American Journal Pharmacy*, April 1918, p. 253) reviewed the published work of several other investigators on this subject and criticized the official standards and tests. He concluded "that it was possible to prepare Tincture of Ginger by the U. S. P. IX formula, in which the percentage of water-soluble solids is in excess of the 15 per cent. limit of the U. S. P. Further, that this percentage of water-soluble constituents is variable, depending upon the length of time the water is allowed in contact with the solids and also, to a great extent, upon the manner in which the solids are brought in contact with the water, and if this test serves any practical purpose and is to be retained, the U. S. P. should state the way and manner in which it is to be obtained."

He also criticizes the official directions for obtaining the total residue and contends that to prevent adulteration the minimum as well as the maximum for total solids should be given.

Under the title Zingiberis the U. S. P. IX describes five commercial varieties of ginger named in accordance with their geographical source, but it directs that the Jamaica Ginger only is to be used in preparation of the fluidextract and the tincture. The question arises why should standards be given for commercial varieties that are not used in medicine or that are actually prohibited in the official

formulas. There are, nevertheless, sound economic reasons why the Pharmacopœia should not discriminate against commercial varieties of drugs that are satisfactory no matter what may be their geographical source. However, it is a fact that the ginger used in pharmaceutical manufacture or sold in the drug trade in the United States is practically limited to few commercial varieties—the African and the Jamaica and occasionally the Cochin—and so for the purpose under consideration our experiments were limited to the two first-named varieties. The writers know that some pharmaceutical manufacturers prefer to make the tincture from the African ginger because it yields a product having a deeper color which appeals to a certain class of purchasers as an evidence of strength, and also that other manufacturers prefer a mixture of the African and Jamaica as yielding a blend of both flavor and color which they consider more satisfactory.

This investigation was for the definite purpose of determining the results that would be obtained in practice by following the pharmacopœial process under the usual store or laboratory conditions. A quantity of good commercial ground African and of ground Jamaica gingers was selected and all the experiments were carried out on these two samples. Instead of making the menstrua employed of definite alcoholic percentages, the American custom of taking measured volumes of alcohol U. S. P. and of water was followed. In each experiment 500 cubic centimeters of tincture were prepared without any attempt to control existing temperatures, which at times were "summer heat." The percolators were covered with plates of glass and the loss of alcohol under these conditions, corresponding closely with those usually found in pharmacies, it is believed was not above the average in practice.

In each experiment, the percolation was slowly carried on until 500 cubic centimeters of tincture were obtained, and then continued with the same menstruum until three additional percolates of 100 cubic centimeters each were successively collected. The resulting tinctures were examined as to clearness, color, flavor, specific gravity, alcohol content. It was decided to make the determination of total solids by taking 10 cubic centimeters instead of 10 grams and drying to constant weight at 100° C. and to meet the just criticism of Mr. J. P. Snyder the water-soluble solids in this residue were determined by taking two portions of 10 cubic centimeters each of water and after triturating the residue with a glass rod with these successive portions, filtering and evaporating the solution at a temperature of 100° C. The residue from 10 cubic centimeters of each of the three portions of weaker percolates collected was likewise determined. The marc was subsequently air-dried and 2 grams thereof exhausted with ether, and the ether solution evaporated. The residue from the ether extraction and the residue from the weaker percolates determined the completeness of the alcoholic extraction.

As the percentage of water was increased it became more difficult to percolate the drug. This was first observed in experiment No. 13, the menstruum of which was alcohol 7, water 3. The difficulty of percolation increased rapidly as the percentage of water was increased until with diluted alcohol as the menstruum it was almost impossible to percolate even coarse ground drug.

The tabulated statement on the following page shows the results obtained in this series of experiments.

It is recommended that for the purpose of making the official tincture, the

Experiment No.	Drug used for 500 cc. tinct.	Menstruum.	Sp. gr. tinct.	Alcoholic content, % by vol.	Residue 10 cc. tinct., Gm.	Residue water solution, Gm.	Residue 10 cc. 1st weak percolate.	Residue 10 cc. 2nd weak percolate.	Residue 10 cc. 3rd weak percolate.	Residue ether extraction 2 Gm. dried marc.	Appearance of tincture.	After keeping 1 year.	Extraction.
1	Jamaica 100 Gm.	Alcohol	0.8167	85.	0.114	0.015	0.030	0.020	0.006	0.002	Golden amber-brown, brilliant clear	Remains same	Complete
2	African 100 Gm.	Alcohol	0.8172	84.5	0.144	0.019	0.025	0.015	0.005	0.000	Clear dark amber-brown	Remains same	Complete
3	Jamaica 50 Gm. African 50 Gm.	Alcohol	0.8167	84.	0.136	0.015	0.025	0.009	0.008	0.000	Clear dark amber	Remains same	Complete
4	Jamaica 200 Gm.	Alcohol	0.8229	82.3	0.246	0.028	0.034	0.016	0.010	0.006	Clear dark golden brown	Remains same	Practically complete
5	African 200 Gm.	Alcohol	0.8229	82.3	0.300	0.020	0.019	0.010	0.005	0.006	Clear, dark brown	Remains same	Practically complete
6	Jamaica 100 Gm.	Alcohol 9 Water 1	0.8447	80.	0.179	0.096	0.025	0.015	0.005	0.000	Clear, bright amber-brown	Remains same	Complete
7	Jamaica 100 Gm.	Alcohol 7 Water 3	0.8605	77.2	0.184	0.115	0.030	0.015	0.010	0.000	Clear, bright amber-brown	Remains same	Complete
8	Jamaica 100 Gm.	Alcohol 4 Water 1	0.8723	73.	0.194	0.124	0.060	0.024	0.011	0.002	Clear, amber-brown (not brilliant)	Scant precipitate	Practically complete
9	Jamaica 100 Gm.	Alcohol 3 Water 1	0.8941	69.	0.200	0.190	0.035	0.030	0.023	0.009	Not entirely clear, amber-brown	Some sediment	Not entire
10	Jamaica 200 Gm.	Alcohol 3 Water 1	0.8974	66.9	0.380	0.215	0.085	0.055	0.045	0.010	Not entirely clear, amber-brown	Some sediment	Not entire
11	African 100 Gm.	Alcohol 3 Water 1	0.8930	66.3	0.260	0.145	0.035	0.036	0.030	0.014	Not entirely clear, brown	Slightly cloudy some sediment	Not entire
12	African 200 Gm.	Alcohol 3 Water 1	0.8989	65.4	0.415	0.272	0.085	0.060	0.050	0.018	Not clear, brown	Decidedly cloudy	Not entire
13	Jamaica 100 Gm.	Alcohol 7 Water 3	0.8983	61.8	0.221	0.112	0.049	0.035	0.030	0.015	Cloudy	Distinct precipitate	Incomplete
14	Jamaica 100 Gm.	Alcohol 3 Water 2	0.9220	52.6	0.274	0.156	0.049	0.024	0.024	0.029	Turbid, unsightly	Decided precipitate	Incomplete
15	Jamaica 100 Gm.	Alcohol 11 Water 9	0.9381	49.4							Turbidity increased	Increasing precipitate	Incomplete
16	Jamaica 100 Gm.	Diluted alcohol	0.9615	42.33							Turbidity increased	Increasing precipitate	Incomplete

Pharmacopœia should recognize African and Jamaica gingers, and possibly also the Cochin variety. It is believed that the drug strength of the tincture of the U. S. P. IX, 200 grams of drug to 1000 cubic centimeters of tincture, is the proper strength for medicinal purposes for which it is used.

If this drug strength be retained the alcoholic strength of the menstruum can with safety be reduced to a menstruum of 850 volumes alcohol to 150 volumes water. Sample No. 7 made by this menstruum completely extracted the drug and the tincture has remained perfectly clear for more than a year. A tincture so made will have an alcoholic content of about 75 to 77 per cent. by volume, thus reducing the alcohol to what is necessary as a solvent.

If, however, the drug strength be doubled in accordance with Treasury Desion No. 3092 then it will be necessary to adopt alcohol as the menstruum.

It is doubtful if it will be necessary to state either the residue or the water-soluble solids therein because if the Pharmacopœia recognizes the use of varieties of ginger other than the Jamaica, there will be a variation in these constants, and, at the most, these statements are of doubtful value as standards.

COMMENTS ON EXTRACT AND FLUIDEXTRACT OF GENTIAN.*

BY K. A. BARTLETT.

The U. S. P. IX directs that Extract of Gentian be made by percolation with cold water, and that the Fluidextract of Gentian be made with a menstruum of diluted alcohol. It is obvious that with this great difference in the menstruums, the finished products are going to contain different constituents. If the alcoholic menstruum is necessary to extract the active principles of gentian it would seem that, to be consistent, this menstruum should be used on the extract as well as on the fluidextract in spite of the higher cost. If, on the other hand, the aqueous menstruum extracts gentian equally as well, it would appear to be the simpler and more economical method.

Records available show that a fluidextract made by the U. S. P. IX formula (Repercolation Method) will average 40 Gm. of extractive in 100 cc. Upon making an extract by the official method the average yield is 32%. The straining of the partially concentrated percolate as directed by the official formula for the extract does not entirely remove the precipitated matter. Therefore the 32% contains some of this precipitate, so that the actual water-soluble extractive would be somewhat less. By taking a definite weight of this extract, dissolving it in water, filtering, washing the precipitate, and reducing the combined filtrates to a constant weight, we find that 70% of the extract is water-soluble matter not precipitated by boiling. This with relation to the drug is about $22\frac{1}{2}\%$.

A review of the literature shows several articles dealing with the extraction of gentian. Water acidulated with sulphuric acid (1 oz. to the gallon) was tried and found unsatisfactory.

William Weber states that gentiopicrin, $\frac{1}{10}$ of 1%, is the active constituent, and is easily soluble in water and alcohol. He suggests therefore that a weaker menstruum might be just as good.

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* Section on Practical Pharmacy and Dispensing, A. Ph. A., Asheville meeting, 1923.