DIGITALIS LUTEA VS. DIGITALIS PURPUREA.*

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The claim has been made that preparations from *Digitalis lutea* give more satisfactory therapeutic results than preparations made from the official variety. S. Marx White and R. Edwin Morris[1] tested clinically infusions and tinctures made from the former plant and claimed that the effects produced were apparently identical with those of the official *Digitalis purpurea*, except possibly so far as nausea and vomiting were concerned. Recently E. L. Newcomb and E. B. Fischer[2] have stated that earlier claims of the superiority of *Digitalis lutea*, due to its having less emetic action, have not been confirmed by later work. Several investigators have assayed *Digitalis lutea* and have obtained results which show that if any superiority exists it is not made apparent by the degree of physiological activity.

F. A. Miller and W. F. Baker[3] have investigated the comparative activity of various species and varieties of Digitalis, among which was a sample of *Digitalis lutea* grown in this country from seed obtained from Germany. The effective dose of a No. 60 powder of this leaf, assayed by the frog-heart method of Cushney, was 0.00065 Gm., and the leaf was, therefore, just equivalent to U. S. P. X requirements. A few years later R. Edwin Norris[4] assayed various species of Minnesota Digitalis by a modification of the Hatcher cat method. *Digitalis lutea* was found to be equal in value to the higher grades of *Digitalis purpurea*, but the lack of irritation and the quiet lethal period noticed in cats suggested the clinical testing in humans which is mentioned above.

J. H. Pratt and Hyman Morrison[5] have assayed by the U. S. P. IX frog method a tincture prepared from a sample of *Digitalis lutea* grown in Minnesota in 1913, and found the minimum lethal dose to be 0.004 cc. per gram of frog weight. E. L. Newcomb and E. B. Fischer[2] found the minumum lethal dose of two samples of *Digitalis lutea* grown in 1923 and 1924 to be 62.3 mg. and 76.5 mg. per kilogram of cat weight respectively, when assayed by a modification of the Hatcher cat method.

Published material does not confirm the claims for the superiority of *Digitalis lutea*, but the matter seemed of sufficient importance to warrant investigation of the comparative activities of the *lutea* and *purpurea* varieties as shown by physiological assay and of their pharmacognostic differences.

In March 1925 we obtained a sample of *Digitalis lutea* in the form of a No. 40 powder. This was grown in the Medicinal Plants Garden at the College of Pharmacy of the University of Minnesota and was assayed in our Biological Laboratories by the one-hour frog method of the U. S. P. IX. The drug was found to possess from 125 to 139% of the required activity. The minimum lethal dose of the powder was, therefore, from 0.00044 to 0.00048 Gm. per gram of frog

* Read before Scientific Section, A. PH. A., Philadelphia meeting, 1926.

[1] *Arch. Internal Med.* 21, 740 (1918).

[2] JOUR. A. PH. A., 14, 669 (1925).

[3] *Ibid.*, 3, 304 (1914).

[4] *Journal-Lancet* 37, 176 (1917).

[5] JOUR. A. M. A., 73, 1606 (1919).

weight. This sample of *Digitalis lutea* shows potency, when assayed by the frog method, equal to but no greater than *Digitalis purpurea*, of which a considerable number of samples tested showed from 100 to 170% of the U. S. P. activity requirements.

An effort was made to determine the possibility of purchasing *Digitalis lutea* in the New York crude drug market. We inquired of most of the leading crude drug houses and found that they were unable to furnish this variety. However, we considered it desirable to find a means of distinguishing *Digitalis lutea* from *Digitalis purpurea*, and it is apparent that the U. S. P. assay is of no value in this respect.

In order to observe pharmacognostic differences under the microscope a portion of the *Digitalis lutea* sample, as received from the University of Minnesota, and a portion of the official variety of *Digitalis* were reduced to a No. 60 powder and examined under the microscope. Only on careful examination and comparison were we able to observe the differences mentioned below. The U. S. P. IX and U. S. P. X descriptions of *Digitalis* do not eliminate *Digitalis lutea*.

Digitalis lutea.	*Digitalis purpurea.*
Multicellular, uniseriate, non-glandular hairs.	
Less numerous than in *Digitalis purpurea*. The cells of the hairs appear to be more often collapsed. The apex of the hair is more blunt than that of *Digitalis purpurea*.	Appear to be more numerous in this species. The walls of the hair cells are comparatively much thicker and the apex is more acute. Due to the thicker cell walls, the space between the cells is much greater than that observed in *Digitalis lutea*.
Stomata.	
In this variety the two guard cells are more elongated and form an elliptical outline. Neighboring cells are much larger. The walls are thicker, very angular and very irregular.	The two cells composing the breathing pore of the leaf form almost a circle in outline. The surrounding or neighboring cells have thin walls and are smooth and wavy, also much smaller than those found in *Digitalis lutea*.

Conclusions.—Our work has shown that *Digitalis lutea* is not superior in activity to *Digitalis purpurea*. When tested by the U. S. P. IX frog method the physiological activity of the former was found to be similar to that usually possessed by good samples of *Digitalis purpurea*, but lower than that occassionally found for the latter. It was found almost impossible to obtain any *Digitalis lutea* in the New York drug market. The U. S. P. X assay and description of *Digitalis* do not eliminate *Digitalis lutea*, but the *lutea* may be distinguished from the official variety by careful comparison under the microscope.

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THE EPHEDRINE CONTENT OF EPHEDRA VULGARIS, VAR. HELVETICA.

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Upon assaying three lots of *Ephedra vulgaris, var. helvetica* by the method recommended by Chen,[1] the U. S. P. IX method for Belladonna Root, using methyl

[1] K. K. Chen, JOUR. A. PH. A., 14, 189 (1925).