A CHEMICAL STUDY OF *PISCARIA SETIGERA* PIPER (EREMOCARPUS).

I. THE OIL OF THE SEEDS.*,[1]

BY J. D. SMITH, J. A. MITCHENER, JR., AND HENRY M. BURLAGE.[2]

Piscaria setigera Piper, also known as Turkey Mullein, a member of the *Euphorbiaceæ*, is an annual, low, heavily scented, hoary throughout with a very dense stellate pubescence; the stems are much branched from near the base, the branches mostly procumbent, 15–60 cm. long. The leaves are alternate, entire, ovate, petioled without stipules. The flowers are small, in axillary clusters, without an involucre, diecious or monecious; the calyx of the staminate flowers is 5–6 parted; of the pistillate, none; stamens are 6–7; the receptical is hairy and the ovary has 4–5 glands at the base, 1-celled, 1-ovuled, densely pubescent. The capsule is 2-valved; the seeds smooth and shining, 4 mm. long. The herb is found growing profusely in dry ground from the Columbia River to Southern California (1, 2).

The Indians are said to have used the plant as an arrow poison and to stupefy fish by throwing the herbage in the water, hence the name *Piscaria* (*i. e.*, belonging to fish). It has also been stated to be of value as a carminative and febrifuge. Our attention was called to the herb because of a reputed value for the treatment of asthmatic conditions by the Indians of the Northwest even at the present time. The most common method of use for relief of this condition was to sleep upon pillows which contained the herb as a filler.

The plant material used in this investigation was collected in the region of Medford, Oregon.

EXPERIMENTAL.

The air-dried ripe seeds of the plant were crushed and extracted in two ways: (1) *Hot Extraction.*—Six hundred grams were successively extracted with petroleum ether, ether, chloroform, etc. The solvents were evaporated off and the respective extracts weighed, and (2) *Cold Percolation.*—One hundred grams of the seeds were percolated with the above-mentioned solvents and absolute alcohol in a percolation apparatus designed to maintain the evaporation of the solvent at a minimum. The following tables show the results of these extractions.

TABLE I.

Solvent.	Hot Extraction. Wt. of Ext.	Hot Extraction. %.	Cold Extraction. Wt. of Ext.	Cold Extraction. %.
Petroleum ether	130.45 Gm.	21.74	22.10 Gm.	22.10
Ether	1.99	0.33	0.80	0.80
Chloroform	1.21	0.20	0.60	0.60
Alcohol			1.85	1.85

This part of our investigation was devoted to a study of the petroleum-ether extracts since this represented by far the greatest amount of material. In the first phase of the work the two types of extracts were kept separate. Both extracts were amber in color; that of the cold extract being somewhat darker; both possessed a castor oil-like odor, a nutty taste and a consistency of heavy mineral oil.

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[1] Pharmaceutical Laboratories, School of Pharmacy, University of North Carolina, Chapel Hill, N. C.

[2] Professor of Pharmacy.

Preliminary tests indicated the absence of nitrogen and sulfur. Of the several qualitative tests carried out (3) it was proved that both extracts were in the main a non-drying fixed oil. The following additional tests were of interest: (1) *Hauchecorn's Reaction* gave a brown-red color with the hot extract and deep amber with the cold, (2) *Wiedmann's test* showed a deep red-brown color to both the acetone and acid layer upon the addition of acid, (3) both extracts solidify with *Cavalli's Reaction*, (4) with *Serger's test* the hot extract yielded a very dark (blue?) lower layer; the cold extract a dark green layer, (5) both extracts yield a pink heavy layer with *Kreis' test*. The cold extract yielded a deeper pink color and (6) both oil layers became darker under the influence of *Soltsein's* and *Becchi's tests*.

The *physical constants* of the oil were determined at 25° C. The specific rotation was ascertained with a Hilger polarimeter and the refractive index with an Abbé refractometer. The oils failed to solidify at −21.3° C.

The *chemical constants* determined were (*a*) acid number (4), (*b*) saponification value (5), (*c*) ester value (5), (*d*) acetyl value (6) and (*e*) iodine value (5).

TABLE II.

	Oil from Hot Extraction.	Oil from Cold Extraction.
d_{25}	0.90628	0.91827
$(\ )_{D25}$	+0.63	.....+
n_{D25}	1.47275	1.47365
Acid number	16.86	11.90
Saponification value	183.22	185.63
Ester number	166.36	173.73
Acetyl value	41.03[x]	9.17[x]
Iodine value	120.5	134.1

+ Value not determined because of the dark color of the oil.

[x] End-points difficult to determine because of the dark color of the oil.

Since the oils from the two extractions were quite similar and the amounts remaining after the preliminary tests were so small they were combined and the fatty acids were separated from the combined sample (135.51 Gm.) by the procedure recommended by Goldstein and Jenkins (7) using (*a*) solution of ammonium carbonate, (*b*) and (*c*) sodium carbonate and (*d*) potassium hydroxide. The weights of these portions were 6.7273, 9.9425, 12.4149 and 11.9077 Gm., respectively. These quantities as well as the free acids obtained after saponification of the oil are now being studied.

SUMMARY.

1. The seeds of *Piscaria setigera* yield essentially a non-drying fixed oil.
2. The physical and chemical properties of the oil are reported.

REFERENCES.

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(3) Rosenthaler, L., "The Chemical Investigation of Plants," English translation of the 3rd German Edition, pages 69–71 (1930).

(4) United States Pharmacopœia XI, page 444.

(5) *Ibid.*, page 445.

(6) "Methods of Analysis," *Assoc. Official Agr. Chem.*, 4th Edition, pages 417–418.

(7) Goldstein, S. W., and Jenkins, G. L., JOUR. A. PH. A., 25, 637 (1936).