

It will be noted that Lemon Oil as such is no longer used in the manufacture of the tincture. The tinctures are made to contain large amounts of lemon peel extractive matter, both by using large amounts of peel, and by extracting this with strong alcohol, instead of with proof spirit, as directed in the British Pharmacopoeia of 1885.

The following analytical results were obtained with tinctures made in the laboratory according to B. P. directions, as above given.

Mean result upon *Tinctura Limonis*, prepared according to B. P. directions, Ed'n 1898.

Specific gravity.....	0.8769
Rotation, 2 dm. at 20°C.....	+3.8
Equivalent Lemon Oil.....	1.2 p.c.
Alcohol (volume p. c.).....	75.08

It will be noted that the water present in fresh lemon peel, freed as much as possible from the white, inner layer, reduces the alcohol strength from 90 per cent in the original solvent, to 75 per cent in the finished tincture; and that the lemon oil in the tincture averages only 1.2 per cent. The maximum content of oil found in any tincture made here from commercial lemons, was 1.4 per cent.

As a matter of interest I furnished samples of these tinctures to several persons, to be used as flavouring material, in order that their value for such purpose might be judged by actual baking tests. The unanimous opinion was that they were of good quality, as to flavour, but much weaker than the ordinary lemon extract of commerce. It appeared to be necessary to use from two to four times the volume usually employed, in order to get satisfactory results in intensity of flavour.

The United States standard for Lemon Extract is as follows:—"Lemon Extract is the flavouring extract prepared from oil of lemon, or from lemon peel, or both, and contains not less than five (5) per cent by volume of oil of lemon."

"A flavouring Extract is a solution in ethyl alcohol of proper strength, of the sapid and odorous principles derived from an aromatic plant, or parts of the plant, with or without its colouring matter, and conforms in name to the plant used in its preparation."

"Oil of lemon is the volatile oil obtained by expression or alcoholic solution, from the fresh peel of the lemon (*Citrus limonum*), has an optical rotation (25°C.) of not less than +60° in a 100 mm. tube, and contains not less than four (4) per cent by weight of citral."

It would appear from the results upon Tincture of Lemon above quoted, that an extract of lemon, to contain five per cent of lemon oil, if prepared direct from the lemon peel with 90 per cent alcohol would require the employment of  $\frac{5}{100} \times 250 = 1.042$  parts of lemon peel to prepare 1,000 parts of the finished product. This is more than twice the weight of peel prescribed by the U. S. Pharmacopoeia (1900) for preparation of the tincture, and more than four times that required by the British Pharmacopoeia. It is indeed doubtful whether an extract of the kind supposed, could be so prepared, because of the large amount of water present in the lemon peel. This would reduce the strength of alcohol, in the finished extract, to about 30 per cent, a strength insufficient to effect the complete extraction of the oil from lemon peel.

It is not, however, to the lemon oil as a whole, that the flavouring value of lemon extract is chiefly due, but to the citral (Geranial) that it contains. Lemon oil contains from 3 to 4 per cent of citral (Squire's Companion, 18th Ed'n, p. 723), so that an extract containing 5 per cent of the oil may contain about 0.2 per cent of citral. Citral is stated by Squire (Op. cit. p. 727) to possess about 15 times the flavouring power of lemon oil; and it is evident that citral is the really important component of Extract of Lemon, as used for flavouring purposes. The direct estimation of citral is apparently the true basis of valuation. It is unfortunate that methods applicable to the exact determination of citral in commercial extract of lemon are not available. Work is now being done with a view to the elaboration and perfecting of such methods.