

Oil of Lemon Grass (*Oleum Graminis Citrati*) contains citral. As obtained from this source citral has a flavour quite different from that of the lemon, and resembling that of verbena. Lemon Grass citral is, nevertheless, employed as an adulterant of lemon oil (Squire's, *Op. cit.* p. 725), and is doubtless substituted for lemon citral, in the cheaper lemon extracts. The perfecting of a chemical method for direct determination of citral, would not serve to distinguish between citral from lemon and citral from lemon grass. It is, perhaps, to ensure the presence of a true lemon product, that the standard fixed by the United States requires the presence of 5 per cent of oil of lemons. Since, however, it is possible to substitute lemon grass citral in place of lemon citral, in lemon oil itself, the fact of the presence of lemon oil terpenes (which constitute over 90 per cent of lemon oil) is not a guarantee of the genuineness of the article.

It would seem that a useful assay of lemon extract involves (1) a determination of citral (2) an identification of the citral as that from lemons. Determinations of alcohol and of lemon oil are not sufficient to establish the genuineness or the value of a lemon extract for flavouring purposes. Strong alcohol is not needed to keep the citral in solution, and its employment merely adds to the cost of the article, without increasing its value to the consumer. It certainly enables a high percentage of lemon oil to be dissolved; but, as we have seen, it is not upon the terpenes of lemon oil that the flavouring value depends.

As in the case of many articles of food, which are valued chiefly for their flavour, bouquet or aroma, it must be granted that, in the present state of our knowledge, the trained palate or olfactory nerve of the expert is a surer guide than the analytical methods of the laboratory. Until we perfect a process for the determination of citral, and further devise a method of certainly distinguishing between the citral derived from lemons and that derived from lemon grass, we must depend upon the connoisseur in flavours to enable us to place, in proper order of value, the various lemon extracts of commerce. It is true that we can show (as is done in this, and previous reports) the content in alcohol, and in lemon oil; but a high strength in alcohol is only requisite to keep the oil in solution; and it is not upon the oil content that the value of the extract depends, but upon the amount of lemon citral present. This is so small that a very weak alcohol suffices to hold it in solution.

If the extract is made from fresh lemon peel, as directed by the pharmacopoeias, in the preparation of tinctures, it is certainly necessary to employ strong alcohol, because the water in the peel reduces the strength of the alcohol proportionately to the amount of peel used; and we have seen that to obtain an extract of 5 per cent oil strength, we must employ an amount of peel at least equal to the weight of extract desired. But commercial extract of lemon is seldom or never made from the peel, but from the oil. Dilute alcohol is not further diluted in the operation of dissolving citral from the oil, as in the case of dissolving citral from the peel. Hence a comparatively weak alcohol, even below proof strength, is quite efficient; and while taking but small amounts of the terpenes into solution, effects a notable solution of citral, with the production of an extract which commands ready sale.

It is not even necessary that lemon oil should be employed in the manufacture of lemon flavouring extract. A very satisfactory extract can be made by the direct solution in alcohol of so called, terpeneless oil of lemon. This is the residue from a fractional distillation of lemon oil, and contains the citral, normally belonging to the lemon oil together with citronellal, and other components to which the flavour of lemon oil is due.

To sum up:—

1. Extract of lemon is valued for its characteristic flavour.
2. This flavour depends upon the presence of certain constituents of lemon oil.
3. The terpenes, which constitute more than 90 per cent of lemon oil, are not important from the point of view of contributing flavour to the oil.
4. It is mainly to dissolve the terpenes of lemon oil that strong alcohol is used as a solvent.
5. The citral, citronellal, and other flavour giving components of lemon oil, constitute less than 10 per cent. of the oil, and may be effectively got into solution, from the oil, by weak alcohol.