RAPE OIL AS AN ADULTERANT OF OLIVE OIL.*

BY REGINALD MILLER AND C. W. BALLARD.

The United States Pharmacopœia X provides specific tests for the detection of cottonseed, sesame and peanut oils in olive oil, as well as constants for specific gravity, saponification number and iodine value for the latter. Owing to the variability of olive oils and natural oils generally, it is necessary that maximum and minimum limits be stated for these constants. Herein lies a possibility for adulteration which is not provided against in the current revision. By skilful manipulation it is possible to add 20–25% of purified rapeseed oil to an olive oil and secure a mixture which will come within the official figures. Olive oils adulterated in this manner have been encountered in the food regulatory work of this laboratory. Admittedly such oils in food commerce need not conform to the pharmacopœial standards, but the very fact that they meet these presumably more stringent requirements increases the difficulties of prosecution. Undoubtedly rapeseed oil was not in vogue as an olive oil adulterant prior to the present revision, hence the omission of specific tests for its presence. A curious legal angle of the situation is the claim that the Pharmacopœia names all likely adulterants for olive oil and provides specific tests for their detection. Reasoning legally along these lines, it was alleged that rapeseed oil was an unlikely adulterant because no mention was made of it in the Pharmacopœia. Possibly such claims might be invalidated by a general notation providing that the naming of specific adulterants in the text of a monograph is not to be construed as limiting the adulterants to those so specified. It is desirable to continue the present procedure and it is manifestly impossible to name all the possible adulterants in the limited confines of the official monograph.

With the exception of the specific gravity and the solidification temperature, the constants of olive and rapeseed oils are sufficient to clearly distinguish one from the other and the several constants are herewith presented:

	Olive Oil.		Rapeseed Oil.
Authority.	U. S. P. X.	"Food Analysis."*	"Food Analysis."*
Specific gravity	0.910–0.915 at 25°	0.915–0.918 at 15°	0.913–0.917 at 15°
Saponification value	190–195	185–196	168–179
Iodine value	79–90	77–95	94–105
Solidification temperature	0°	−6° to +10°	−10° to +10°
Refractive index	....	1.4659–1.4685	1.4708–1.4723

* "Food Analysis," Leach, 4th Edition.

Investigation by the laboratory showed that it was possible to adulterate olive oil with rapeseed oil and yet have the mixture conform to the constants for pure olive oil. In the determinations a pure olive oil, a purified rapeseed oil and a mixture of 75 parts olive oil and 25 parts rapeseed oil were used. The work was checked by several chemists of the staff and is summarized in part in the following tabulation:

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* Scientific Section, A. Ph. A., Miami meeting, 1931.

	Olive Oil.	Rapeseed Oil.	Mixed Oils (75 Olive + 25 Rape).
Iodine value	83.5	99.9	87.9
Saponification number	....	....	190.3
Refractive index at 25°	1.4678	1.4720	1.4687
Critical temperature of dissolution or Valenta number	69.2°	83.4°	72.0°

The above results show how closely this mixture of olive and rapeseed oils approaches the constants of a pure olive oil. It will also be noted that figures are stated for the critical temperature of dissolution or Valenta number. In the experience of this laboratory, the Valenta number is the most satisfactory means of detecting this particular adulterant. The details of this test are herewith abstracted from "The Technical Handbook of Oils, Fats and Waxes," Percival J. Freyer and Frank E. Weston, Volume II, 1920, Cambridge University Press.

> Prepare a standardized solvent by taking equal volumes 92% ethyl alcohol and pure amyl alcohol and add water until pure almond oil gives a corrected turbidity at 70° C. when tested in the following manner. To 5 cc. of the standardized solvent add an equal volume of the dry oil to be tested; warm until clear; allow to cool and note temperature at which the first sign of turbidity appears during stirring. A correction for acidity is added to the recorded temperature and the result is termed the True Valenta Number.

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A NOTE ON THE TITRATION OF BORIC ACID.*

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INTRODUCTION.

The titration of boric acid has warranted the attention of the analytical and physical chemist. The acid in aqueous solution behaves like a weak monobasic acid having a dissociation constant of 6.6×10^{-10} at 25° C. The end-point in titration with alkali occurs at about p_{H} 11 (1). The change in the hydrogen-ion concentration upon the addition of various types of polyhydric alcohols has been observed for years. Mannitol and glycerin augment the dissociation constant of the acid roughly ten-thousand-fold. This change has been studied by Hildebrand. The properties of the mannitol-boric acid complex were studied by Maugauini (2) in 1890. This investigator emphasized the importance of having the solution of the polyhydric alcohol concentrated and furthermore showed that upon dilution the complex was completely hydrolyzed. Very recently Dodd (3) studied the accuracy of the titration with various indicators and found phenolphthalein the most satisfactory.

Based upon theoretical considerations Prideaux (4) titrated boric acid in aqueous solution using tropeolin O as an indicator. The p_{H} range of this indicator is approximately 11.1 to 12.7. This investigator determined the p_{H} of a solution containing equal molar quantities of boric acid and sodium hydroxide and found it to be approximately 11. He titrated boric acid in 0.2 to 0.3 molar solution, using about 0.2 cc. of 0.04 per cent solution tropeolin O as an indicator. His results were

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* Scientific Section and Section on Practical Pharmacy and Dispensing, A. PH. A., Miami meeting, 1931.