## The Acids of Coffee

The study of the acids of coffee has been productive of much controversy and many contradictory results, few of which possess any value. The acid of coffee is generally spoken of as "caffetannic acid." Quite a few attempts have been made to determine the composition and structure of this compound and to assign it a formula. Among them may be noted those of Allen, who gives it the empirical formula C14H16O7; Hlasiwetz, who represents it as C15H18O8; Richter, as C30H18O16; Griebel, as C18H24O10, and Cazeneuve and Haddon, as C21H28O14. It is variously supposed to exist in coffee as the potassium, calcium, or magnesium salt. In regard to the physical appearance of the isolated substance there is also some doubt, Thorpe describing it as an amorphous powder, and Howard as a brownish, syrup-like mass, having a slight acid and astringent taste.

The chemical reactions of "caffetannic acid" are generally agreed upon. A dark green coloration is given with ferric chloride; and upon boiling it with alkalis or dilute acids, caffeic acid and glucose are formed. Fusion with alkali produces protocatechuic acid.

K. Gorter has made an extensive and accurate investigation into the matter, and in reporting upon the same has made some very pertinent observations. His claim is that the name "caffetannic acid" is a misnomer and should be abandoned. The so-called "caffetannic acid" is really a mixture which has among its constituents chlorogenic acid (C32H38O19), which is not a tannic acid, and coffalic acid. Tatlock and Thompson have expressed the opinion that roasted coffee contains no tannin, and that the lead precipitate contains mostly coloring matter. They found only 4.5 percent of tannin (precipitable by gelatin or alkaloids) in raw coffee.

Hanausek demonstrated the presence of oxalic acid in unripe beans, and citric acid has been isolated from Liberian coffee. It also has been claimed that viridic acid, C14H20O11, is present in coffee. In addition to these, the fat of coffee contains a certain percentage of free fatty acids.

It is thus apparent that even in green coffee there is no definite compound "caffetannic acid," and there is even less likelihood of its being present in roasted coffee. The conditions, high heat and oxidation, to which coffee is subjected in roasting would suffice to decompose this hypothetical acid if it were present.

In the method of analysis for caffetannic acid (No. 24) given at the end of this chapter, there are many chances of error, although this procedure is the best yet devised. Lead acetate forms three different compounds with "caffetannic acid," so that this reagent must be added with extreme care in order to precipitate the compound desired. The precipitate, upon forming, mechanically carries down with it any fats which may be present, and which are removed from it only with difficulty. The majority of the mineral salts in the solution will come down simultaneously. All of the above-mentioned organic acids form insoluble salts with lead acetate, and there will also be a tendency toward precipitation of certain of the components of caramel, the acidic polymerization products of acrolein, glycerol, etc., and of the proteins and their decomposition products.

In view of this condition of uncertainty in composition, necessity for great care in manipulation, and ever-present danger of contamination, the significance of "caffetannic acid analysis" fades. It is highly desirable that the nomenclature relevant to this analytical procedure be changed to one, such as "lead number," which will be more truly indicative of its significance.