Waters
Lab Highlights
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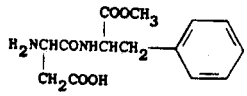
HOW SWEET IT IS!

Aspartame - It sounds like something Cleopatra said as she clasped a friendly-looking serpent to her bosom! In fact it is a new sweetener which is now an allowed food additive in a number of countries. Recently it was accepted by the FDA for use in the USA in a variety of foods such as powdered drinks, breakfast cereals, chewing gum, dry mixes for gelatines, desserts and toppings and in pre-sweetened coffee or tea extracts. Canada and South Africa allow its use in soft drinks.

Terms like "artificial" or "synthetic" sweeteners suggest that the chemists have been fooling around with nature again. In this case, from a biochemical viewpoint, aspartame looks innocuous enough, being the methyl ester of a combination of two amino acids, aspartic acid and phenylalanine. Its structure is:



(See Merck Index #863)

Aspartame has a sweetening effect about 180 times that of sucrose (1), i.e. aspartame is about half as sweet as saccharin. Because of its chemical nature, its use is more limited than some of the other "synthetic" sweeteners. If heated in aqueous solutions it is reactive. Its main degradation product is diketopiperazine. None of its reaction products have been found to be harmful but the reaction products are not sweet. This instability in aqueous solutions is why the sweetener is used mainly in dry foods which may be mixed with water just before consumption. For the same reason its use in cooked products is limited.

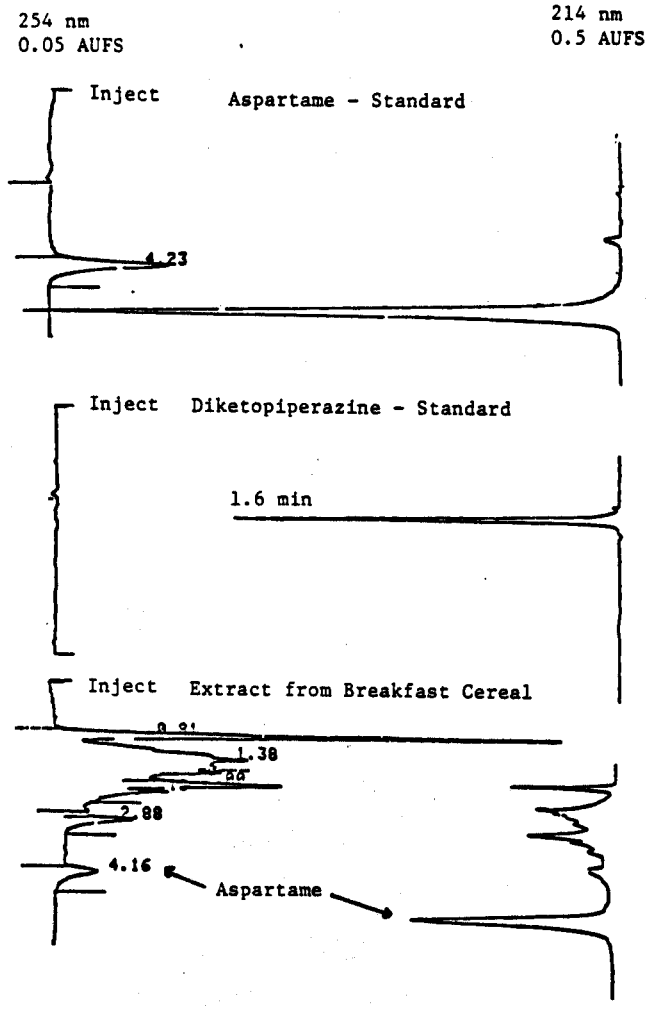
A characteristic of amino acids is their ability to react with reducing sugars (often glucose) in foods to form the "Maillard" or "non-enzymic browning" pigments which give characteristic colors and flavors to many cooked foods. Aspartame could enter into this same chemical pathway.

Despite this reactivity, aspartame still has many potential uses as a low-calorie sweetener which does not have the characteristic, bitter aftertaste of saccharin. It is manufactured by G. D. Searle and sold in the US under the trade names of NutraSweet™ and Equal™.

HPLC is suited to the analysis of aspartame as shown in the accompanying chromatograms (Mike Woodman, Chicago). Note the good UV response of aspartame at 214 nm. In this case 214 nm may be a better choice of wavelength than 254 nm in food extracts as the absorbance of aspartame appeared to increase proportionately more than the other UV absorbers extracted from the food.

This separation was done using a µBONDAPAK™ C_{18} cartridge and is thus feasible for use in the QA-1™ Quality Analyzer -- something we kept in mind when the method was developed.

Another interesting sidelight -- at least for Waters people -- is that the first preparation of significant amounts of pure aspartame was accomplished at G. D. Searle using a PrepLC™ 500!



Conditions: µBONDAPAK™ C_{18} cartridge in Z-Module™
Mobile Phase: 25:CH_3CN, 75:H_2O + low UV PIC® B-7
Flow Rate: 2 ml/min

Mike Woodman - Chicago
Roy Day - Milford
John Morawski - Milford

(1) Food Tech., 35 (No. 9) 126 (1981).