

Albersheim P, Nevins D J, English P D & Karr A. A method for the analysis of sugars in plant cell-wall polysaccharides by gas-liquid chromatography. *Carbohydr. Res.* 5:340-5, 1967.  
[Dept. Chem., Univ. Colorado, Boulder, CO]

**This paper is designed to allow those working on complex carbohydrates to determine accurately and easily the neutral sugar compositions of their preparations. [The SC® indicates that this paper has been cited over 265 times since 1967.]**

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May 30, 1979

"At the beginning of the 1960s, it was impossible to quantitate accurately the neutral sugar compositions of complex carbohydrates. A major step towards such quantitation was achieved by Charles Sweeley and his colleagues who showed that volatile derivatives of sugars could be used for quantitative analysis by gas chromatography.<sup>1</sup> The Sweeley group synthesized trimethylsilyl derivatives. These derivatives proved very useful for the quantitative analysis of carbohydrates containing one or, at most, a few different sugars, but this method had the major disadvantage that most sugars yielded four different derivatives, the alpha and beta anomers of the furanosidic and pyranosidic ring forms. This multiplicity of derivatives inhibited quantitation.

"Our laboratory studies the compositionally complex polysaccharides of plant cell walls, polysaccharides too complex to analyze by the trimethylsilyl derivatives. The single volatile alditol acetate that could be derived from each monosaccharide liberated by acid hydrolysis of the cell wall polysaccharides appeared to be a good choice for this

analysis. A postdoctoral research associate, Donald J. Nevins, and two graduate students, Patricia D. English and Arthur Karr, and I under-took to develop an analytical method based on this derivative. We were well into our work when a paper was published by Sawardeker, Sloneker, and Jeanes which demonstrated the utility of the alditol acetate derivatives.<sup>2</sup> Those authors did not develop the method in as much detail as we did, but they did publish the essence of the method. We spent considerable time developing an efficient chromatography column material, went to great lengths to make the method useful for multiple samples, and presented sufficient data to demonstrate the accuracy of the method. Actually, the manuscript was not well received by the editors of the journal. We were forced to delete about half of our data, which I feel was a serious mistake.

"The reason that the manuscript has been cited so frequently is that the alditol acetate method became the method of choice for sugar analysis, and Bengt Lindberg's group in Stockholm utilized the alditol acetates as the basis for developing a facile method for glycosyl linkage composition analyses of complex carbohydrates. Their glycosyl linkage analysis, which utilizes partially methylated alditol acetate derivatives, has been far more important to structural analysis of polysaccharides than the sugar composition analysis which we worked on.<sup>3</sup>

"'Methods' papers appear to receive far more citations than 'results' papers. I don't feel that this paper, which has become a 'Citation Classic,' is one of the more important contributions from our laboratory. It is a very useful contribution, but I feel that the importance of this laboratory's scientific achievements cannot be measured by this particular paper."

1. Sweeley C C, Bentley R, Makita M & Weils W. Gas-liquid chromatography of trimethylsilyl derivatives of sugars and related substances. *J. Amer. Chem. Soc.* 85:2497-505, 1963.
2. Sawardeker J S, Sloneker J H & Jeanes A R. Quantitative determination of monosaccharides as their alditol acetates by gas-liquid chromatography. *Analyt. Chem.* 37:1602-4, 1965.
3. Bjorndal H, Hellerqvist C G, Lindberg B & Svensson S. Gas-liquid chromatography and mass-spectrometry in methylation analysis of polysaccharides. *Angew. Chem. Int. Ed.* 9:610-19, 1970.