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Note

Paper chromatographic solvent for the separation of sugars and alditols

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It has been stated that the resolution of alditol mixtures is one of the most troublesome problems in the paper chromatography of carbohydrates, that the various stereoisomeric alditols are separated poorly, and that the mobilities of the alditols are nearly identical with the mobilities of their corresponding sugars[1]. One solvent system[2] that works effectively to separate glucose and glucitol has been reported. This system, however, would not resolve glucitol from mannitol and resolved mannose from glucose only poorly. In the present communication, a new solvent is reported that resolves the common monosaccharides from each other and also resolves the alditols from each other and from their parent monosaccharides.

TABLE I

DISTANCES MIGRATED AND R_G VALUES FOR MONOSACCHARIDES AND THEIR ALDITOLS WITH THE NITROMETHANE–ACETIC ACID–ETHANOL–WATER SATURATED BORIC ACID SYSTEM

Compound	*Cm migrated from origin*		R_G
	(6 h)	*(12 h)*	
D-Glucose	4.9	9.5	1.0
D-Glucitol		22.4	2.4
D-Mannose		11.8	1.2
D-Mannitol		18.2	1.9
D-Fructose		16.0	1.7
D-Galactose		14.2	1.5
D-Xylose	12.2		2.5
Xylitol	15.5		3.2
D-Arabinose	11.4		2.3
D-Arabinitol	14.6		3.0
D-Ribose	21.4		4.4
Ribitol	14.2		2.9
2-Deoxy-D-*erythro*-pentose	24.5		5.0
2-Deoxy-D-*erythro*-pentitol	19.4		4.0
L-Rhamnose	16.9		3.4
L-Rhamnitol	19.8		4.0

The solvent system is 8:1:1:1 (v/v/v/v) nitromethane–acetic acid–ethanol–water saturated with boric acid. A 50-cm length of Whatman No. 3 MM paper was spotted with various monosaccharides and their alditols (see Table I). The monosaccharides were commercial products. The majority of the alditols were prepared by reduction of the monosaccharides with sodium borohydride (the exceptions being D-glucitol and D-mannitol, which were commercial preparations). The paper was irrigated for 6 or 12 h at 40° by the descending technique. The compounds were detected by the silver nitrate dip-technique[3], modified by substitution of 0.5M sodium hydroxide in 80% ethanol containing 4% pentaerythritol for methanolic sodium hydroxide. This substitution facilitates the detection of carbohydrates in the presence of boric acid[4]. The results of the separations are given in Table I.

The elevated temperature of 40° accelerates and facilitates the separations. The hexoses require the longer irrigation time of 12 h, whereas pentoses and the deoxyhexoses migrate very rapidly and can be separated in 6 h. In the majority of the cases, the alditols migrate faster than their parent sugars; ribose and deoxy-*erythro*-pentose are exceptions and migrate faster than their corresponding alditols.

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