Note

Purification of commercial maltose and improved detection of oligosaccharides on paper chromatograms

J. Lehrfeld
Northern Marketing and Nutrition Research Division, Agricultural Research Service, U. S. Department of Agriculture, Peoria, Illinois 61604 (U. S. A.)

(Received April 15th, 1971; accepted May 21st, 1971)

Commercial maltose hydrate, even the best grade presently available from several distributors, contains appreciable amounts of D-glucose, maltotriose, and other starch-derived oligosaccharides and dextrins (Fig. 1B). Recrystallization from aqueous ethanol does not remove them. A recommended purification procedure

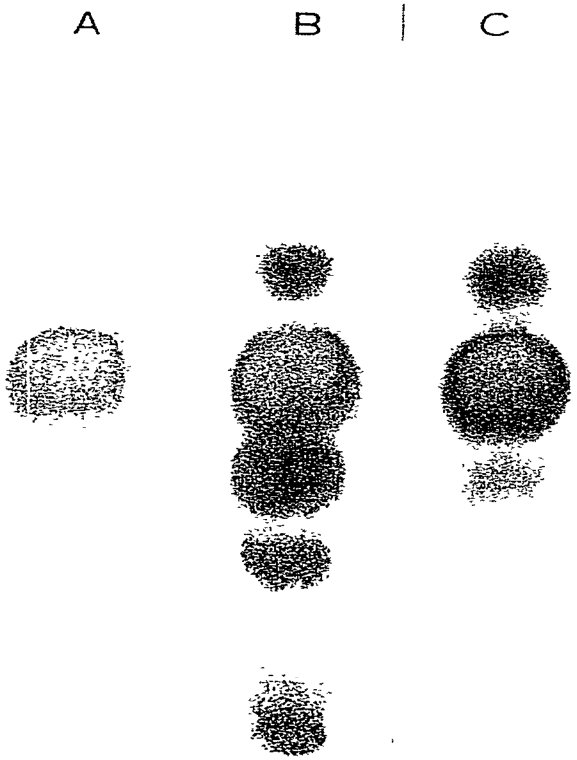

Fig. 1. Lane A, purified maltose, sprayed with amyloglucosidase after development; Lane B, commercial maltose sprayed with amyloglucosidase after development; Lane C, commercial maltose visualized without prespraying with enzyme.

requires acetylation, several recrystallizations of the octaacetate, deacetylation, and another recrystallization[1]. Hodge *et al.*[2] isolated pure maltose from the limit-dextrins of amylopectin treated with β-amylase by a lengthy enzymic procedure. Pazur[3] treated 100 g of soluble starch with β-amylase and isolated 30 g of maltose. In this procedure charcoal was used to adsorb maltose and other oligosaccharides from the reaction mixture. After the charcoal had been filtered off on a Büchner funnel, maltose was eluted with 10% ethanol in water. A similar, but shorter, procedure is now shown to be useful for the purification of commercial maltose.

Paper chromatography was used to check the purity of commercial maltose and purified maltose. A marked increase in sensitivity for the higher oligosaccharides and dextrins is achieved if the developed chromatogram is first sprayed with a 0.1% solution of amyloglucosidase. After the separated oligosaccharide spots have been hydrolyzed to D-glucose, their increased reducing power allows visualization by Trevelyan's procedure[4], as shown in Fig. 1B as compared with visualization without the enzyme (Fig. 1C).

EXPERIMENTAL

Charcoal Darco-G60* (226 g) was washed several times with distilled water and then poured into a 12.5 cm Büchner funnel, and vacuum was applied to the filter flask. When the water level reached the surface of the charcoal, a 10% solution of maltose (500 ml) was poured onto the column. The D-glucose and maltose were eluted with 1,500 ml of water followed by 2,500 ml 5% ethanol in water. The aqueous effluent contained most of the maltose. Higher oligosaccharides can be eluted by raising the concentration of ethanol. The combined eluates were concentrated under vacuum in a rotary evaporator. The syrupy residue was dissolved in 100 ml of water, ethanol was added until the solution became cloudy, and the solution was refrigerated. The white precipitate of maltose hydrate (Fig. 1A) was filtered and dried; recovery 33.5 g (67%) $[\alpha]_D^{25}$ +130.4° (*c* 2.88, water).

Analytical chromatograms were developed on Schleicher and Schüll 2043-B paper (9 in. height ×20 in. width) for 3 h at 75° by using 70% propyl alcohol in water as the solvent[5]. The paper was sprayed with a 0.1% solution of amyloglucosidase and incubated for 30 min at 25°. The dried chromatogram was dipped into a 1%, solution of silver nitrate in acetone, dried, redipped in 0.5% KOH in ethanol, dried, and then washed with 4% aqueous sodium thiosulfate.

REFERENCES

1 M. L. Wolfrom and A. Thompson, *Methods Carbohyd. Chem.*, 1 (1962) 334.
2 J. E. Hodge, E. M. Montgomery, and G. E. Hilbert, *Cereal Chem.*, 25 (1948) 19.
3 J. H. Pazur, *Methods Carbohyd. Chem.*, 1 (1962) 335.
4 W. E. Trevelyan, D. P. Procter, and J. S. Harrison, *Nature*, 166 (1950) 444.
5 D. French, J. L. Mancusi, M. Abdullah, and G. L. Brammer, *J. Chromatogr.*, 19 (1965) 445.

---

*Mention of a company name or a product by the U. S. Department of Agriculture does not imply approval or recommendation of the company or product to the exclusion of others which may also be suitable.