



LIFESPAN TECHNOLOGIES

Direct Carbohydrate Detection Solutions
www.lifespantech.com

A SHORT ARTICLE ABOUT DEXTRAN AND ITS EFFECTS ON THE SUGAR INDUSTRY

Dextran is a complex, branched glucan polysaccharide made of many glucose molecules composed of chains of varying lengths. The straight chain consists of α -1,6 glycosidic linkages between glucose molecules, while branches begin from α -1,4 linkages (and in some cases, α -1,2 and α -1,3 linkages as well).

Dextran is synthesized from sucrose by certain lactic-acid bacteria, the best-known being **Leuconostoc mesenteroides** and *Streptococcus mutans*.



THE FIELD

Most dextran is built up **after harvest** due to a variety of avoidable reasons:

- Long waiting time between harvest and crushing in the mill
- Wet and hot climate conditions
- Exposure to dirt and mud
- Burning of cane fields notably aggravates the phenomenon
- Billeted cane is more affected than wholestick cane



Long transportation time between field and factory aggravates the problem...



THE MILL/FACTORY

Effects of dextran on factory performance :
sugar recovery

- direct loss due to metabolism (<1%)
- loss due to dextran mediated juice impurity
- loss due to reduced growth of crystals

clarification, filtration & throughput

- suspended matter may be carried over to juice due to dextran's function as protective colloid

raw sugar quality

- false increased polarization readings due to dextran
- reduced filterability of raw sugar
- buildup of dextran in raw sugar causes carry over to the refinery

The graph on the right illustrates the loss of overall sugar recovery as a function of dextran contamination (from Ravno&Purchase 2005)

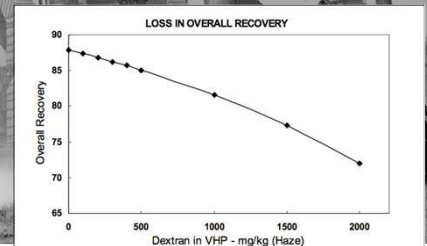


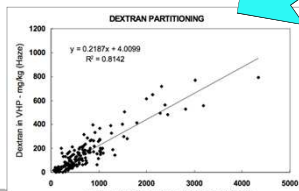
Figure 9. Estimated loss in sugar recovery due to dextran.

graph taken from Ravno & Purchase (2005)

THE REFINERY

Since dextran accumulates in raw sugar to a huge extent (see graph) the problems described are carried on to the refinery

Drying of sugar is slowed by increased levels of dextran. The stickiness of moist sugar makes it more challenging to package



graph taken from Ravno & Purchase (2005)

THE F&B INDUSTRY

Dextran contamination in incoming sugar causes a variety of problems for the sugar processing industry:

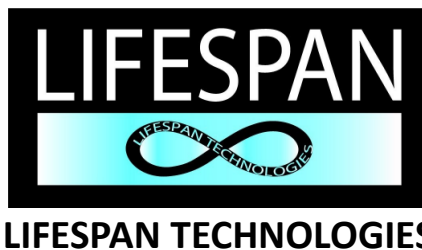
- flocking in alcoholic and acidic beverages
- distortion of hard candy

As a result, sugar purchasers are increasingly demanding low dextran thresholds

THE CONCLUSION

- Dextran causes severe economic damage along the entire value chain of production and processing
- The basis for all prevention strategies is to assess the level of contamination at all links of the chain
- Countermeasures to prevent dextran contamination are available





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AN ELISA FOR DIRECT DEXTRAN QUANTIFICATION

THE COMPANY

LIFESPAN TECHNOLOGIES is involved in manufacture, sales and development of novel dextran and other carbohydrate tests.

We have introduced the first commercial assay kits which use direct binding to measure dextran.

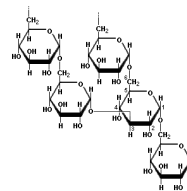
Lifespantech is headquartered in Salt Lake City, Utah, USA and opened an international office in Singapore in 2010.

DEXTRAN STRUCTURE

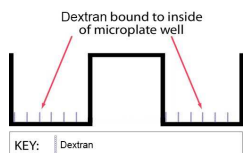
The differing chain lengths of **Dextran** result in molecular weights that vary from a few thousand to a few million Daltons

Larger molecular weight dextrans in sugar cane do the most damage to yield

Lifespantech assays can measure 10 thousand up to 2 million Dalton MW Dextran



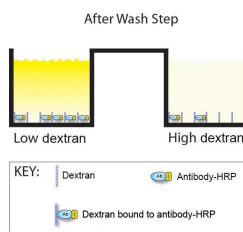
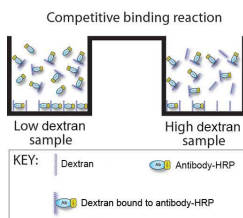
HOW THE ASSAY WORKS



Plates are supplied with dextran already attached.

Steps:

1. Add unknowns and standards to wells.
2. Add dextran detector HRP conjugate to wells.
3. Incubate, wash
4. Add TMB
5. Incubate
6. Add stop reagent
7. Read at 450nm



S-7500 Dextran ELISA

The dextran ELISA is a competitive ELISA in which the colorimetric signal is inversely proportional to the amount of dextran in the sample.

The S-7500 kit has an approximate dynamic range of :

Dextran 10kDa 3 - 1000 ppm

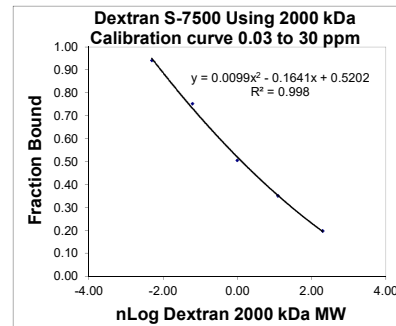
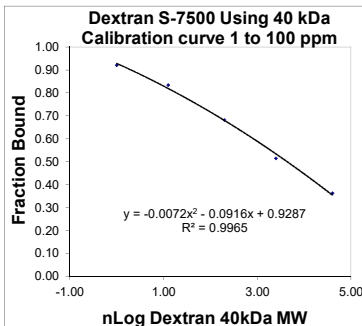
Dextran 40—150 kDa 0.3 – 100 ppm

Dextran 300 kDa 0.03 – 30 ppm

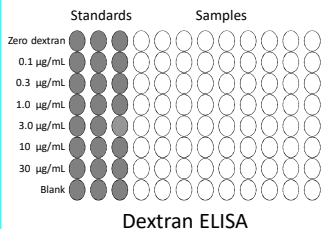
Molecular weights tested: 1.5, 10, 40, 70, 150, and 2000 kDa. Good curves seen using 10, 40, 70, and 150 kDa. 1.5, 500, and 2000 kDa can be used but the range is assay is limited.

Parts per million and micrograms per mL are interchangeable. (1ppm = 1 µg/ml)

The concentration of dextran in the sample is determined using a standard curve of known amounts of dextran.



ELISA PLATE SETUP



Examples of 96-well plates.

ADVANTAGES OF THE ELISA

- Reliable, reproducible results
- High target specificity and accuracy
- Quick validation process for establishment in a new laboratory environment as the assay is an established commercial product
- Convenient and quick handling of large amounts of samples due to 96 well plate format
- Only 50 µl sample material required
- Easy handling
- Complete analysis done in < 1.5 hours

ASSAY CALCULATIONS

Calculate the binding percentage of each sample using the formula:

$$[A_{450}(\text{Sample}) - A_{450}(\text{blank})] / [A_{450}(\text{Zero Dextran}) - A_{450}(\text{Blank})] \times 100 = \% \text{ Binding}$$

Using linear or nonlinear regression, plot a standard curve of percent binding versus concentration of Dextran standard

Determine dextran levels of unknowns by comparing their percentage binding relative to the standard curve. Dextran can be estimated by comparing the values from the wells containing unknowns to the values in the standard curve.

ELISA EQUIPMENT NEEDS

Microplate Washer Microplate Reader (450nm) Multi-Channel Pipette

