



COSMOSIL

HPLC Column for Saccharide Analysis

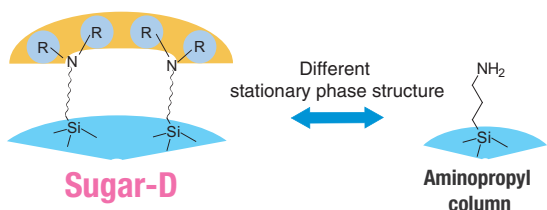
COSMOSIL Sugar-D

- Different selectivity from aminopropyl columns
- Superior quantitative results
- Superior durability
- Anomers remain unseparated

Different selectivity

Polyamine
(secondary/tertiary amine)

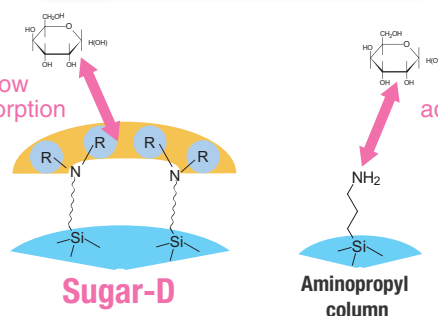
Primary amine



Superior quantitative results

Low adsorption

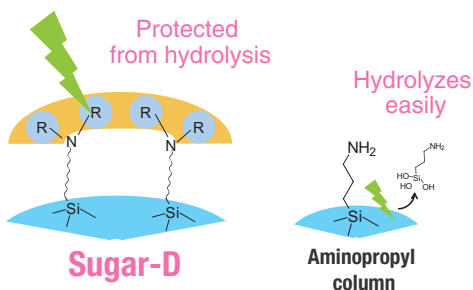
High adsorption



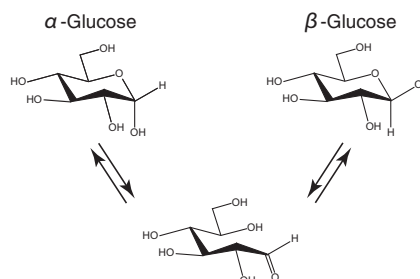
Superior durability

Protected from hydrolysis

Hydrolyzes easily



Anomers elute as one peak



About Sugar-D

Development of Sugar-D

Aminopropyl columns are commonly used for analysis of monosaccharides and oligosaccharides; however, this type of column has several problems, including low durability, poor separation, and adsorption and peak tailing with some analytes. Carbamoyl-based columns separate anomers, which may not be desirable. To solve these problems, we developed a specialty column for sugar analysis with high durability and performance that does not induce irreversible adsorption.

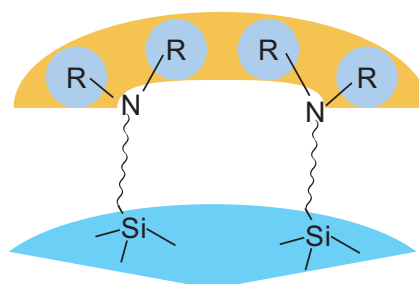
Product Name

Sugar - D

for Saccharide Analysis

Durability

Polyamine-Bonded Silica Gel

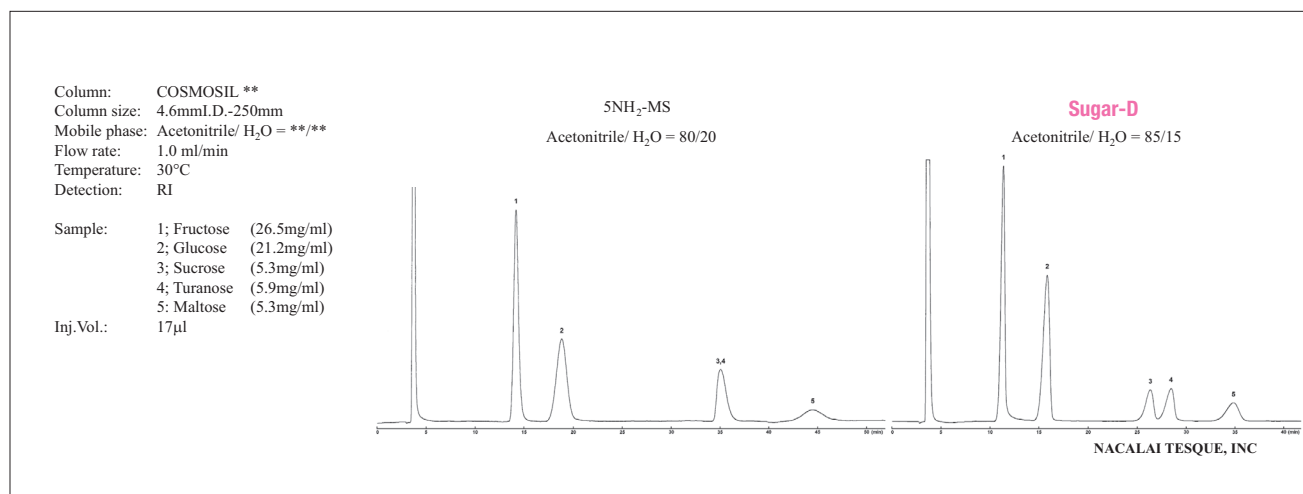


Different selectivity from aminopropyl columns

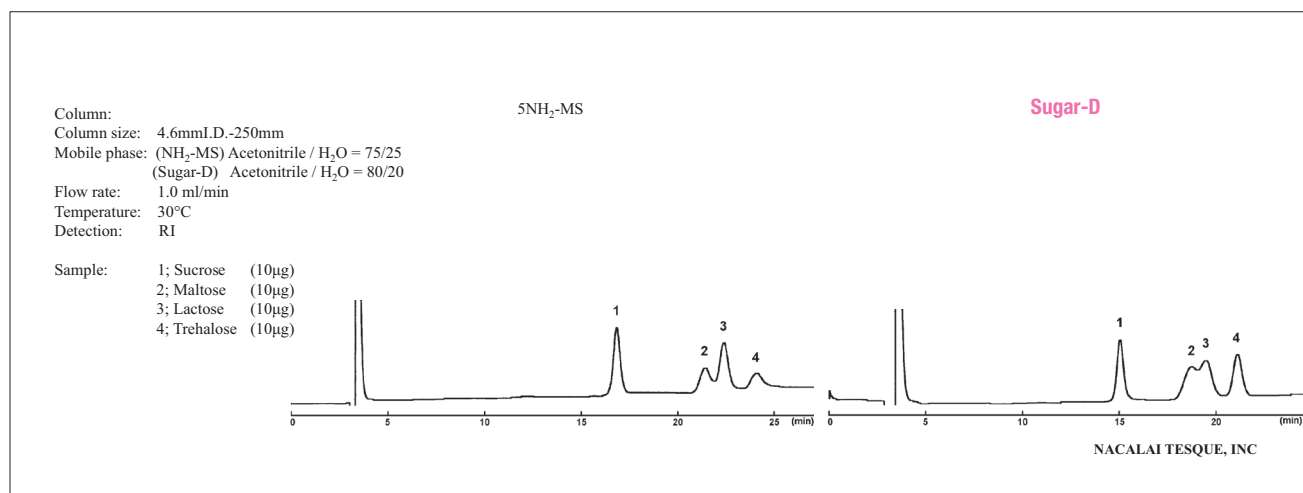
COSMOSIL Sugar-D has a polyamine-based stationary phase, which results in different selectivity from primary amine-based phases, such as aminopropyl.

Comparison to aminopropyl columns

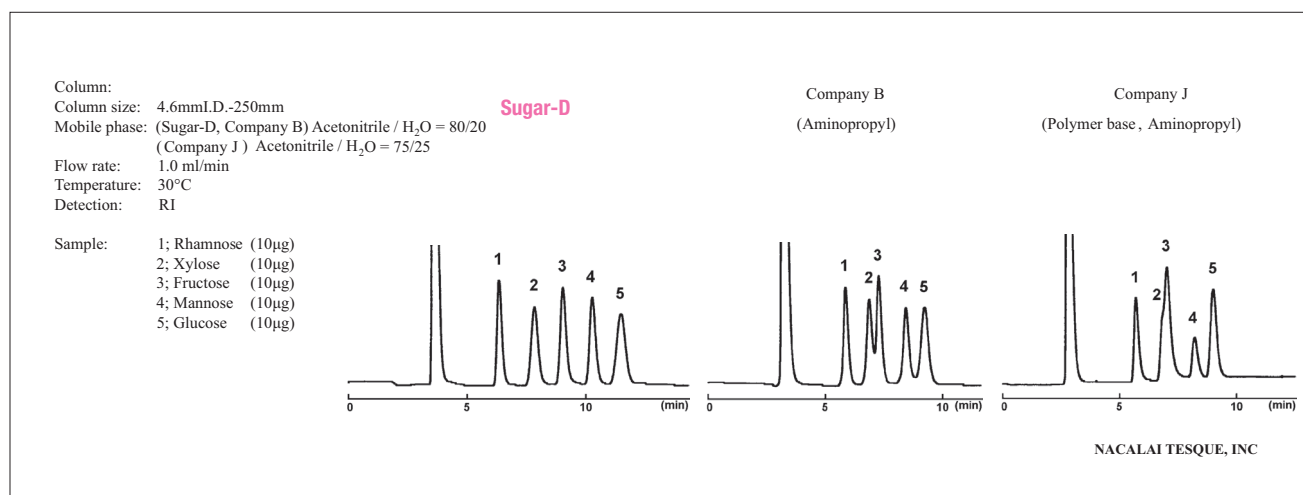
• Sucrose and Turanose



• Maltose and Lactose



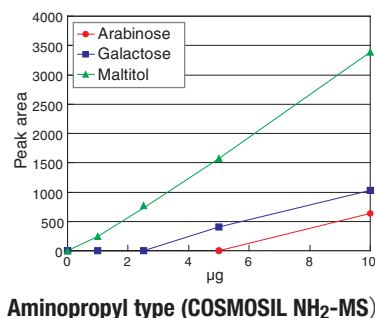
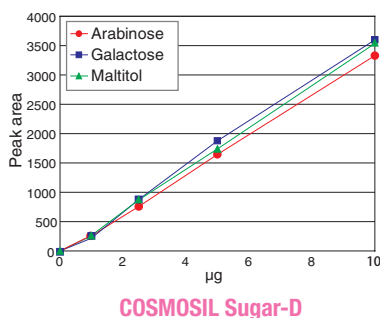
Different selectivity compared to competitor aminopropyl column



Superior quantitative results

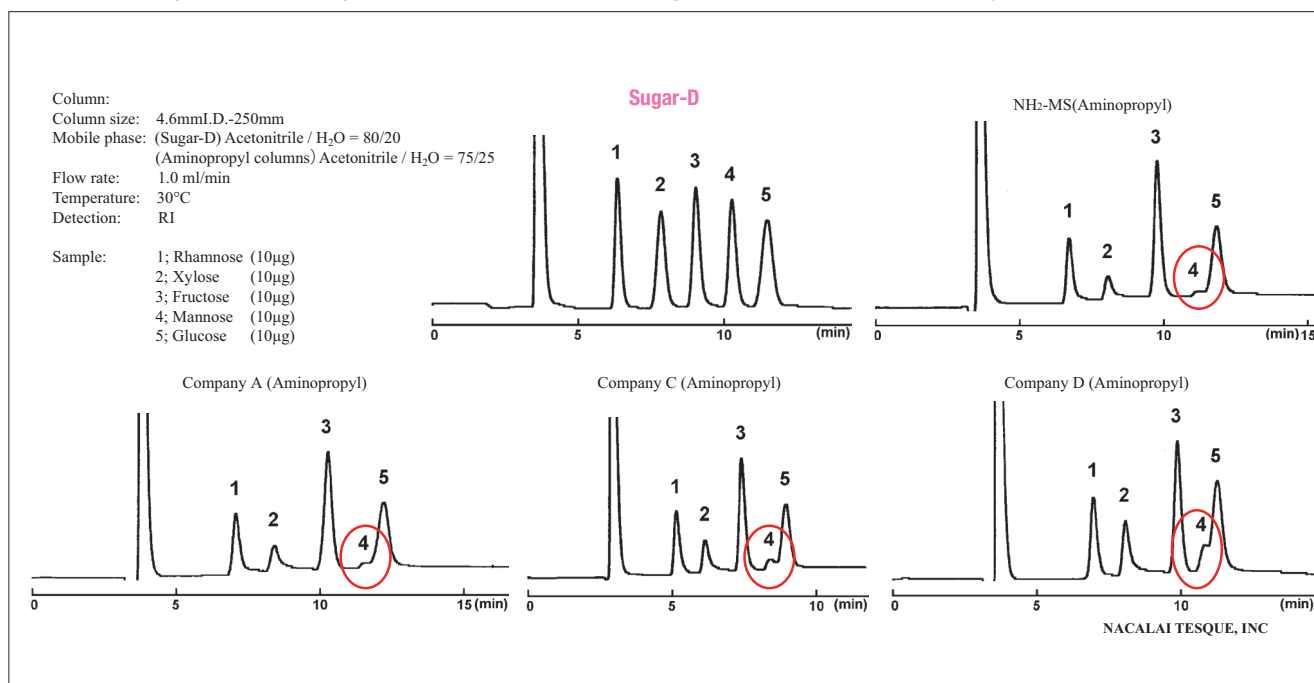
Aldehyde groups in the open-chain form of sugars can form Schiff bases with the amino groups on aminopropyl columns, causing low recovery and peak tailing. COSMOSIL Sugar-D was designed to avoid this, so sugars like arabinose and galactose, which are problematic on aminopropyl columns, elute with sharp peaks. Sugar-D is especially useful for samples of low concentration.

Quantitation at low concentration



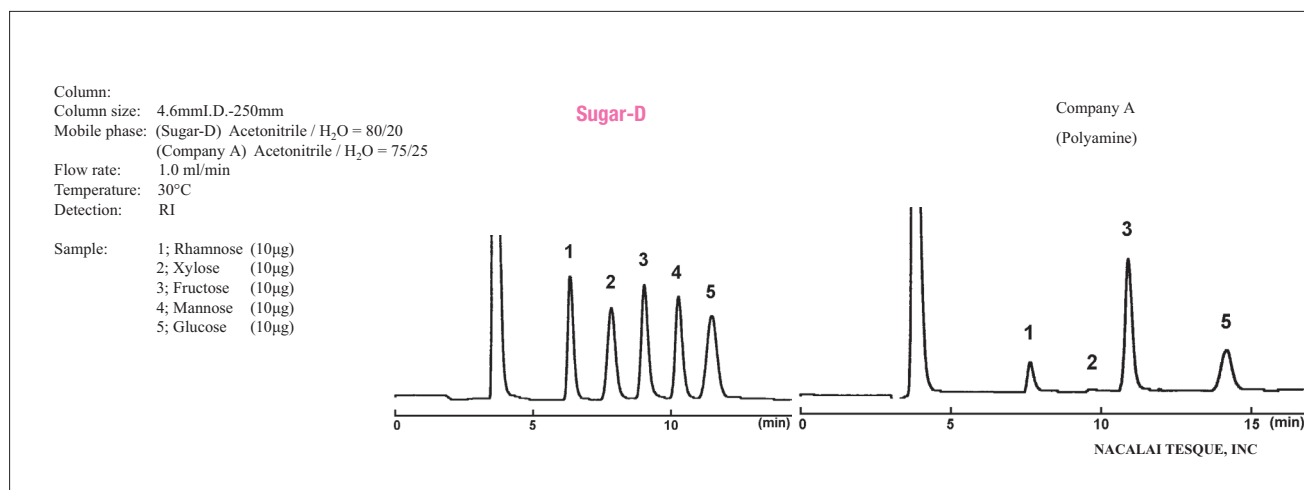
Comparison to competitor aminopropyl columns

COSMOSIL Sugar-D achieves good peak shape, even with sugars that adsorb to aminopropyl columns.



Comparison to competitor polyamine columns

COSMOSIL Sugar-D uses a secondary/tertiary amine-based stationary phase to achieve good performance with difficult samples, such as xylose and mannose. It even exhibits better performance than similar competitors.

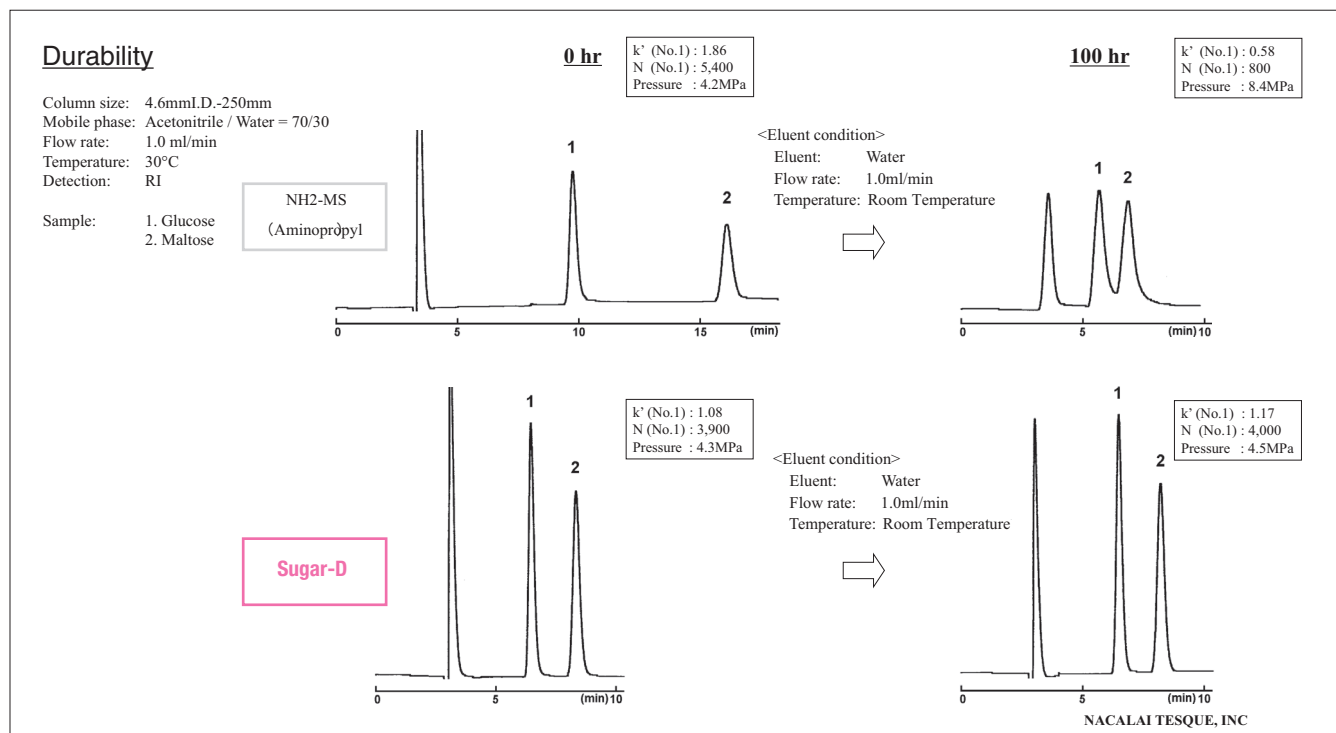


Superior durability

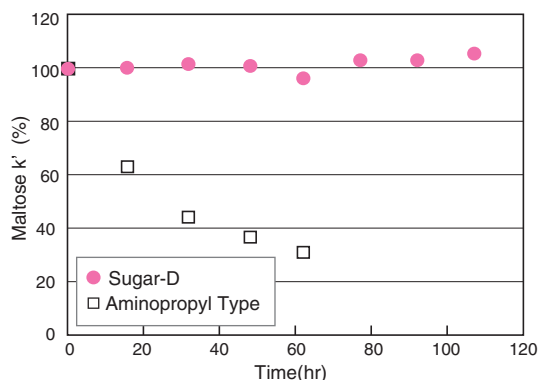
The stationary phase of COSMOSIL Sugar-D is not easily hydrolyzed, so even using water as the mobile phase does not affect it much.

Comparison to aminopropyl columns

After running water for 100 hours, the aminopropyl column's performance was severely degraded, with lower retention and number of theoretical plates. In contrast, Sugar-D was nearly unaffected.



Change in retention factor



[Eluent Condition]

Eluent: Water
Flow Rate: 1.0 ml/min
Temperature: RT

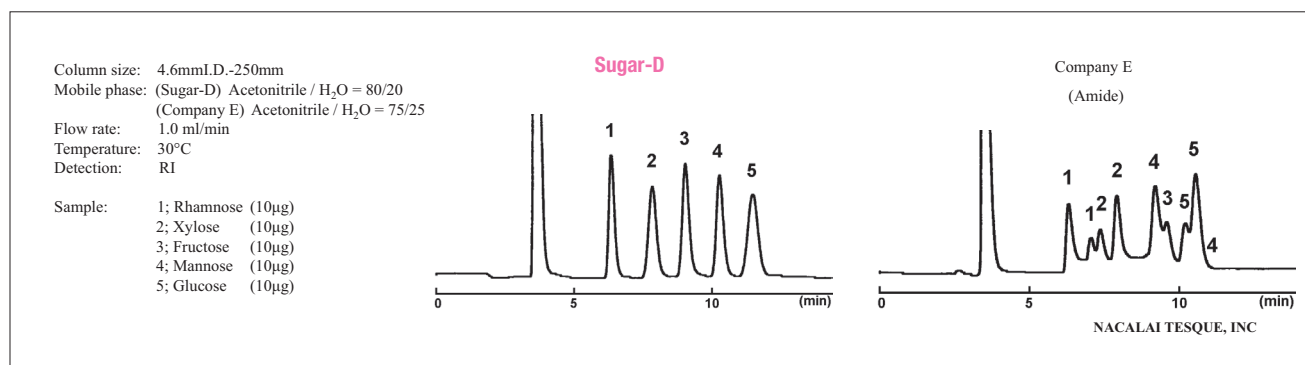
[Test Condition]

Column Size: 4.6 mm I.D. x 250 mm
Mobile Phase: Acetonitrile : Water = 70 : 30
Flow Rate: 1.0 ml/min
Temperature: 30°C
Detection: RI
Sample: Maltose

Anomers remain unseparated

When analyzing sugars with amide columns, anomers may separate unless harsh conditions, such as high temperature and basic solvents, are employed. COSMOSIL Sugar-D does not separate anomers, even under mild conditions.

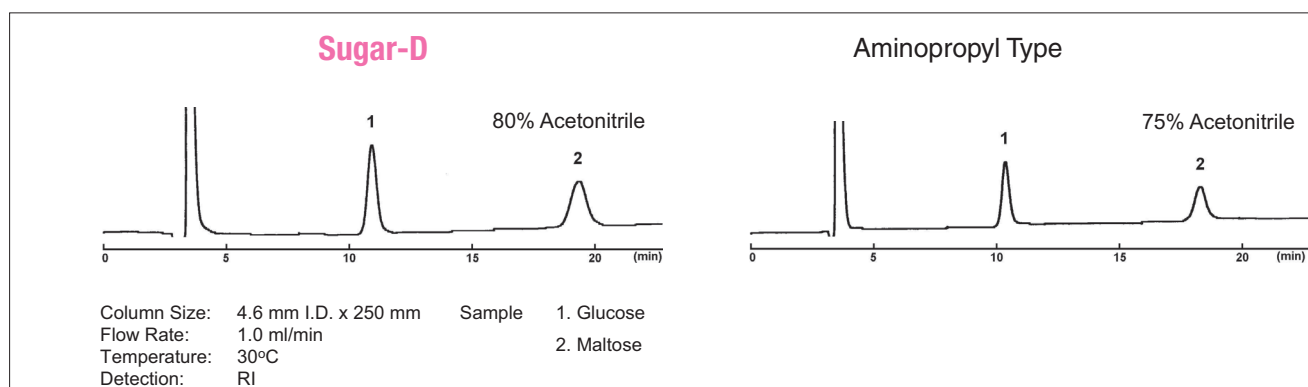
Comparison to amide column



Mobile Phase	
Q1	Usable pH Range
A1	When using a buffer, a pH of 2 to 7.5 is recommended. Under acidic conditions, retention generally becomes shorter, so a neutral pH is recommended.
Q2	Buffers
A2	If a column is used with a buffer, we recommend using it exclusively for buffered mobile phases. Buffers and acids can permanently change separation characteristics, leading to unexpected behavior when using a non-buffered mobile phase. Always filter buffers with a 0.5 um or finer filter before use.
Q3	Organic Solvent
A3	Please use an aprotic, water-soluble organic solvent, such as acetonitrile. Protic solvents like methanol may cause shortened retention.
Q4	Difference in Retention from Aminopropyl Columns
A4	Compared to conventional aminopropyl columns, Sugar-D exhibits slightly lower retention. When transferring methods from aminopropyl columns, increasing the organic solvent ratio by 5 to 10% should result in similar retention time. (See below for an example.)
Column Conditioning	
Q1	Equilibration Time
A1	Compared to C18 columns, HILIC mode columns (including Sugar-D) require longer equilibration time for reproducible analysis.
Q2	Retention Time
A2	During initial use, a column's retention may increase gradually. To stabilize, wash overnight with 100% water.
Washing and Storage	
Q1	Washing
A1	The baseline may destabilize due to impurities adsorbed to the column. To resolve this, please wash with 50:50 acetonitrile/water. If the problem persists, wash again with an increased ratio of water (up to 100%).
Q2	Storage
A2	Wash with a solvent that does not contain buffer or acid, then replace with 90:10 acetonitrile/water. Tightly plug the ends and store in a cool place at room temperature.

Retention Comparison

Compared to conventional aminopropyl columns, Sugar-D exhibits slightly lower retention. When transferring methods from aminopropyl columns, increasing the organic solvent ratio by 5 to 10% should result in similar retention time.



Ordering Informations

COSMOSIL Sugar-D Packed Column

Column Size I.D. x Length (mm)	Product Number
2.0 x 150	05688-41
2.0 x 250	05689-31
3.0 x 150	05690-91
3.0 x 250	05691-81

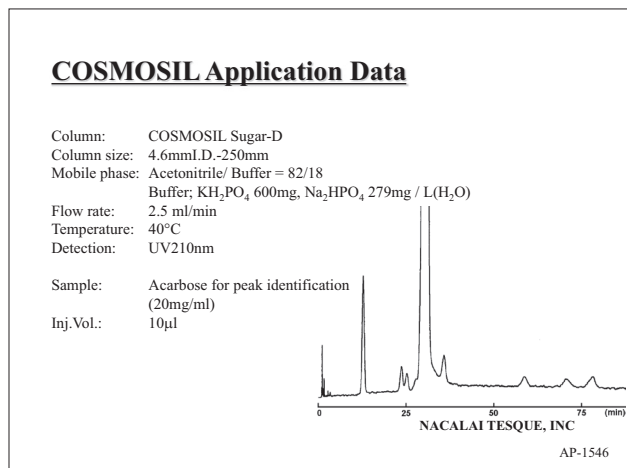
COSMOSIL Sugar-D Guard Column

Column Size I.D. x Length (mm)	Product Number
4.6 x 10	05394-81
10.0 x 20	05696-31
20.0 x 50	05694-51

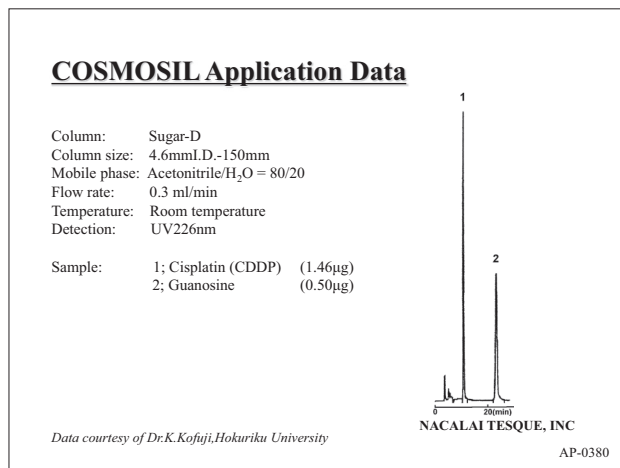
Column Size I.D. x Length (mm)	Product Number
4.6 x 150	05395-71
4.6 x 250	05397-51
10.0 x 250	05692-71
20.0 x 250	05693-61

Drugs

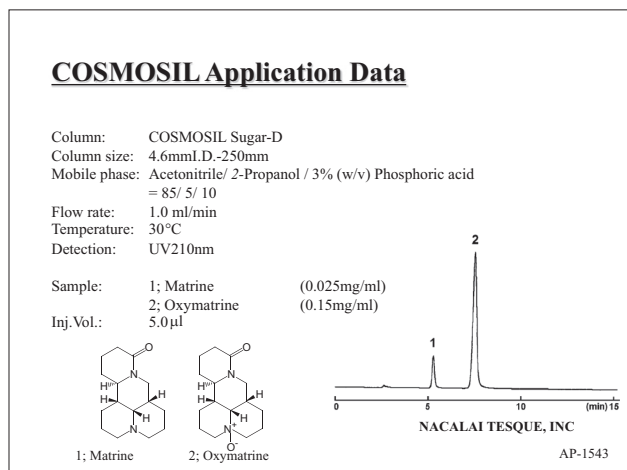
• **Type 2 Diabetes Drug: Acarbose**



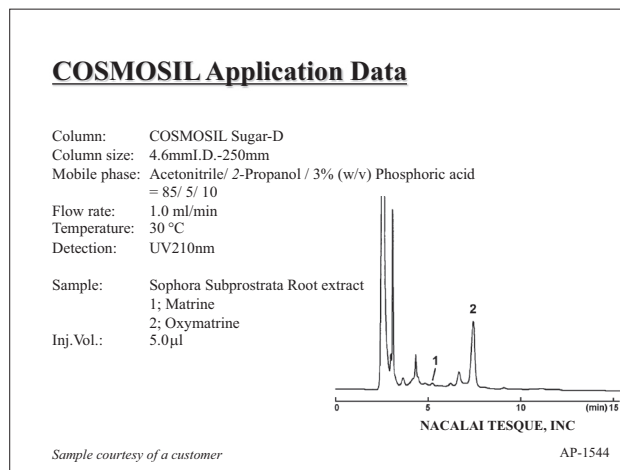
• **Anticancer Drugs**



• **Herbal Medicine Components (Matrine, Oxymatrine)**

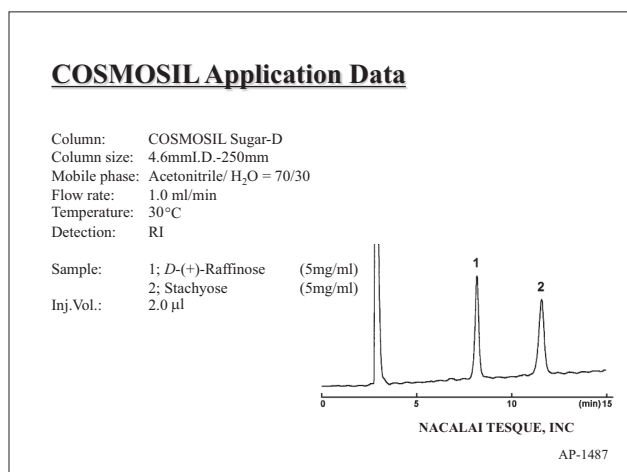


• **Herbal Medicine Components (Matrine, Oxymatrine)**

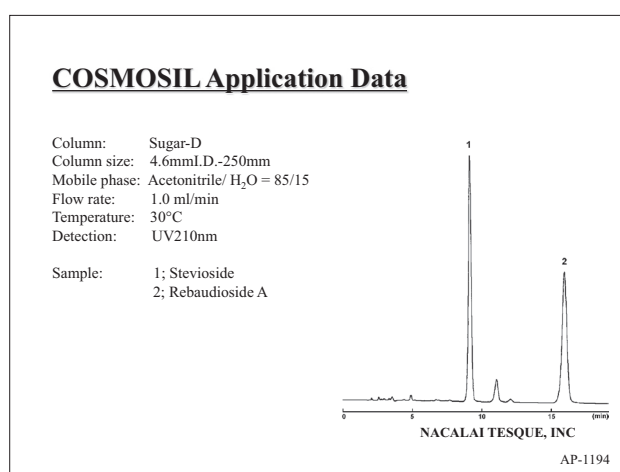


Active Ingredients in Health Food

• **Soy Oligosaccharides (Raffinose, Stachyose)**



• **Stevia Extract (Stevioside, Rebaudioside A)**



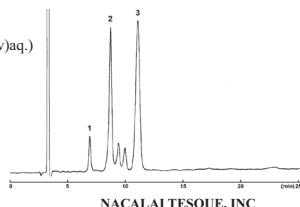
Rare Sugars

Rare Sugar Syrup

COSMOSIL Application Data

Column: Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile/ H₂O = 80/20
Flow rate: 1.0 ml/min
Temperature: 30 °C
Detection: RI

Sample: Rare-Sugar Syrup (10%(v/v)aq.)
1; D-Psicose
2; D-(-)-Fructose
3; D-(+)-Glucose
Inj.Vol.: 2.0µl



NACALAI TESQUE, INC

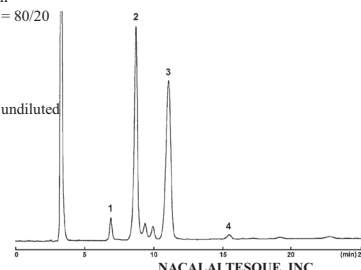
AP-1437

Rare Sugar Soda

COSMOSIL Application Data

Column: Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile/ H₂O = 80/20
Flow rate: 1.0 ml/min
Temperature: 30 °C
Detection: RI

Sample: Rare-Sugar Soda, undiluted
1; D-Psicose
2; D-(-)-Fructose
3; D-(+)-Glucose
4; Sucrose
Inj.Vol.: 2.0µl



NACALAI TESQUE, INC

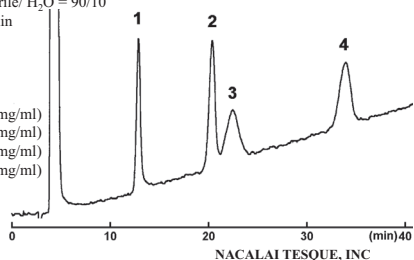
AP-1436

Rare Sugars

COSMOSIL Application Data

Column: Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile/ H₂O = 90/10
Flow rate: 1.0 ml/min
Temperature: 30 °C
Detection: RI

Sample:
1; D-Psicose (2.5mg/ml)
2; D-(-)-Fructose (2.5mg/ml)
3; D-(+)-Allose (2.5mg/ml)
4; D-(+)-Glucose (2.5mg/ml)
Inj.Vol.: 10.0µl



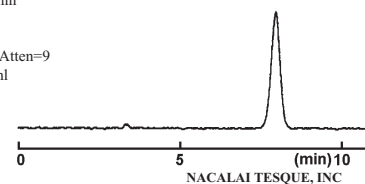
NACALAI TESQUE, INC

AP-1253

D-Allose

COSMOSIL Chromatogram Index

Sample: D-(+)-Allose
CAS No.: [2595-97-3]
Molecular formula: C₆H₁₂O₆
Column: Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile/ H₂O=80/20
Flow rate: 1.0 ml/min
Temperature: 30 °C
Detection: ELSD
Attenuation: Gain=6,Atten=9
Sample conc.: 1.0mg/ml
Injection volume: 3.0µl
Retention time: 8.04min
Capacity factor: 2.04

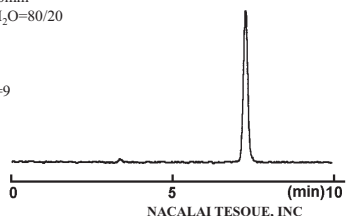
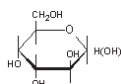


NACALAI TESQUE, INC

D-Altrose

COSMOSIL Chromatogram Index

Sample: D-Altrose
CAS No.: [1990-29-0]
Molecular formula: C₆H₁₂O₆
Column: Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile/ H₂O=80/20
Flow rate: 1.0 ml/min
Temperature: 30 °C
Detection: ELSD
Attenuation: Gain=6,Atten=9
Sample conc.: 1.0mg/ml
Injection volume: 2.0µl
Retention time: 7.28min
Capacity factor: 1.76

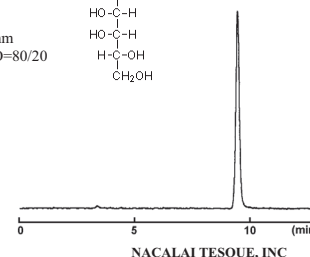
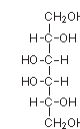


NACALAI TESQUE, INC

D-Dulcitol

COSMOSIL Chromatogram Index

Sample: Dulcitol [Galactitol]
CAS No.: [608-66-2]
Molecular formula: C₆H₁₄O₆
Column: Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile/ H₂O=80/20
Flow rate: 1.0 ml/min
Temperature: 30 °C
Detection: ELSD
Attenuation: Gain=6,Atten=9
Sample conc.: 1.0mg/ml
Injection volume: 3.0µl
Retention time: 9.48min
Capacity factor: 2.59

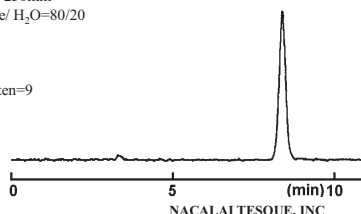
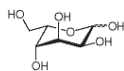


NACALAI TESQUE, INC

• **L-Gulose**

COSMOSIL Chromatogram Index

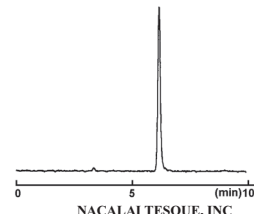
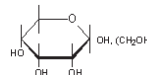
Sample: L-Gulose
CAS No.: [6027-89-0]
Molecular formula: $C_6H_{12}O_6$
Column: Sugar-D
Column size: 4.6mm I.D.-250mm
Mobile phase: Acetonitrile/ H_2O =80/20
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: ELSD
Attenuation: Gain=6, Atten=9
Sample conc.: 1.0mg/ml
Injection volume: 4.0μl
Retention time: 8.44min
Capacity factor: 2.19



• **D-Psicose**

COSMOSIL Chromatogram Index

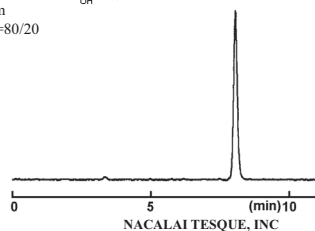
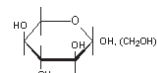
Sample: D-Psicose
CAS No.: [551-68-8]
Molecular formula: $C_6H_{12}O_6$
Column: Sugar-D
Column size: 4.6mm I.D.-250mm
Mobile phase: Acetonitrile/ H_2O =80/20
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: ELSD
Attenuation: Gain=6, Atten=9
Sample conc.: 1.0mg/ml
Injection volume: 2.0μl
Retention time: 6.20min
Capacity factor: 1.35



• **L-Sorbose**

COSMOSIL Chromatogram Index

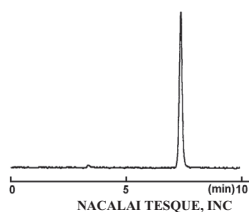
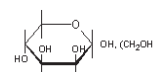
Sample: L-(-)-Sorbose
CAS No.: [87-79-6]
Molecular formula: $C_6H_{12}O_6$
Column: Sugar-D
Column size: 4.6mm I.D.-250mm
Mobile phase: Acetonitrile/ H_2O =80/20
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: ELSD
Attenuation: Gain=6, Atten=9
Sample conc.: 1.0mg/ml
Injection volume: 2.0μl
Retention time: 8.12min
Capacity factor: 2.07



• **D-Tagatose**

COSMOSIL Chromatogram Index

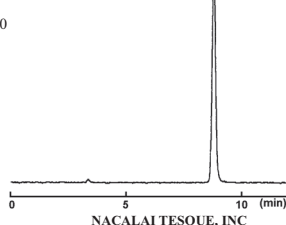
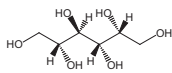
Sample: D-(-)-Tagatose
CAS No.: [87-81-0]
Molecular formula: $C_6H_{12}O_6$
Column: Sugar-D
Column size: 4.6mm I.D.-250mm
Mobile phase: Acetonitrile/ H_2O =80/20
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: ELSD
Attenuation: Gain=6, Atten=9
Sample conc.: 1.0mg/ml
Injection volume: 2.0μl
Retention time: 7.41min
Capacity factor: 1.80



• **D-Talitol**

COSMOSIL Chromatogram Index

Sample: D-Talitol
CAS No.: [643-03-8]
Molecular formula: $C_6H_{14}O_6$
Column: Sugar-D
Column size: 4.6mm I.D.-250mm
Mobile phase: Acetonitrile/ H_2O =80/20
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: ELSD
Attenuation: Gain=6, Atten=9
Sample conc.: 1.0mg/ml
Injection volume: 3.0μl
Retention time: 8.85min
Capacity factor: 2.35



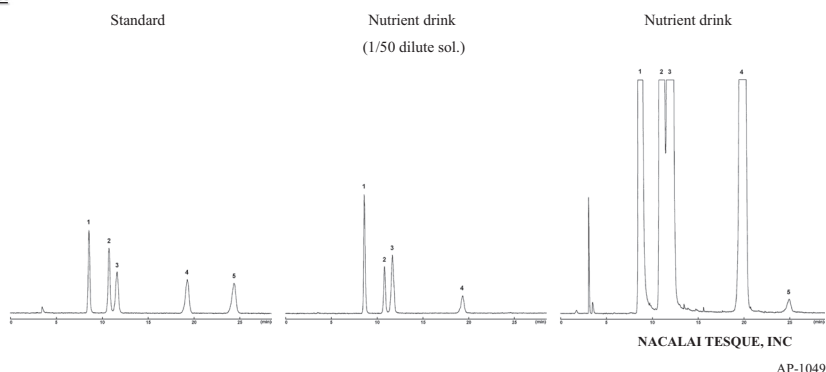
Sugars in Drinks and Candies

Sugars in Drinks

COSMOSIL Application Data

Column: Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile/ H₂O = 85/15
Flow rate: 1.0 ml/min
Temperature: 40°C
Detection: ELSD

Sample: 1; *D*-(-)-Fructose (1.0mg/ml)
2; *D*-(+)-Glucose (1.0mg/ml)
3; *D*-Glucitol(Sorbitol) (1.0mg/ml)
4; Sucrose (1.0mg/ml)
5; *myo*-Inositol (1.0mg/ml)
Injection Vol. 5.0μl

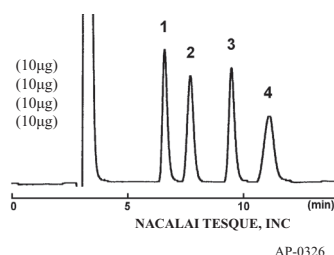


Sugars in Soft Drinks

COSMOSIL Application Data

Column: Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile / H₂O = 75/25
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: RI

Sample: 1; *D*-(-)-Fructose (10μg)
2; *D*-(+)-Glucose (10μg)
3; Sucrose (10μg)
4; Maltose (10μg)

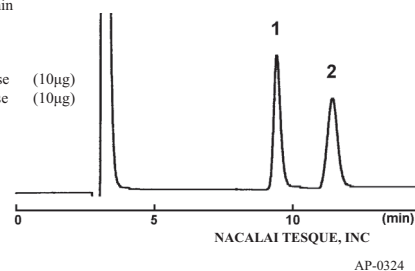


Sugars in Chocolate

COSMOSIL Application Data

Column: Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile / H₂O = 75/25
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: RI

Sample: 1; Sucrose (10μg)
2; Lactose (10μg)

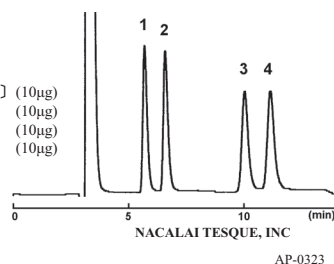


Sugars and Sugar Alcohols in Gum

COSMOSIL Application Data

Column: Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile / H₂O = 75/25
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: RI

Sample: 1; *meso*-Erythritol [*meso* - Erythrite] (10μg)
2; Xylitol (10μg)
3; Palatinose (10μg)
4; Maltitol (10μg)

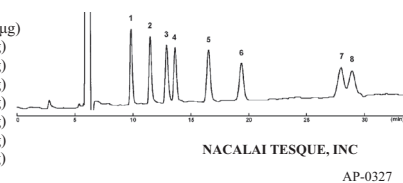


Sugars in Sports Drinks

COSMOSIL Application Data

Column: Sugar-D
Column size: (4.6mmI.D.-250mm) × 2
Mobile phase: Acetonitrile / H₂O = 75/25
Flow rate: 1.0 ml/min
Temperature: 50°C
Detection: RI

Sample: 1; *meso*-Erythritol [*meso* - Erythrite] (10μg)
2; *D*-(-)-Fructose (10μg)
3; *D*-Glucitol (10μg)
4; *D*-(+)-Glucose (10μg)
5; Sucrose (10μg)
6; Maltose (10μg)
7; Maltotriitol (10μg)
8; Maltotriose (10μg)



Sugars in Drinks and Candies

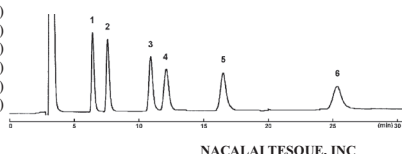
• Sugar Alcohols in Gum

COSMOSIL Application Data

Column: Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile / H₂O = 75/25
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: RI

Sample:

1; Xylitol (10µg)
2; D-(-)-Mannitol (10µg)
3; Maltitol (10µg)
4; Palatinit (10µg)
5; Maltotriitol (10µg)
6; Maltotetraitol (10µg)



NACALAI TESQUE, INC

AP-0325

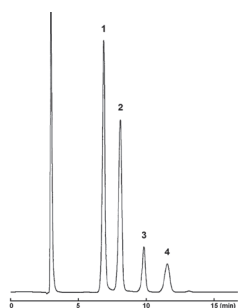
Sugars in Honey and Syrup

• Standard

COSMOSIL Application Data

Column: COSMOSIL Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile/ H₂O = 75/25
Flow rate: 1.0 ml/min
Temperature: 30 °C
Detection: RI

Sample: 1; D-(-)-Fructose (30mg/ml)
2; D-(+)-Glucose (24mg/ml)
3; Sucrose (6mg/ml)
4; Maltose (6mg/ml)
Inj. Vol.: 5.0µl



NACALAI TESQUE, INC

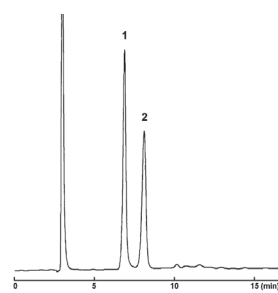
AP-1533

• Honey

COSMOSIL Application Data

Column: COSMOSIL Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile/ H₂O = 75/25
Flow rate: 1.0 ml/min
Temperature: 30 °C
Detection: RI

Sample: Honey (50mg/ml)
1; D-(-)-Fructose
2; D-(+)-Glucose
Inj. Vol.: 5.0µl



NACALAI TESQUE, INC

AP-1536

• Honey

COSMOSIL Application Data

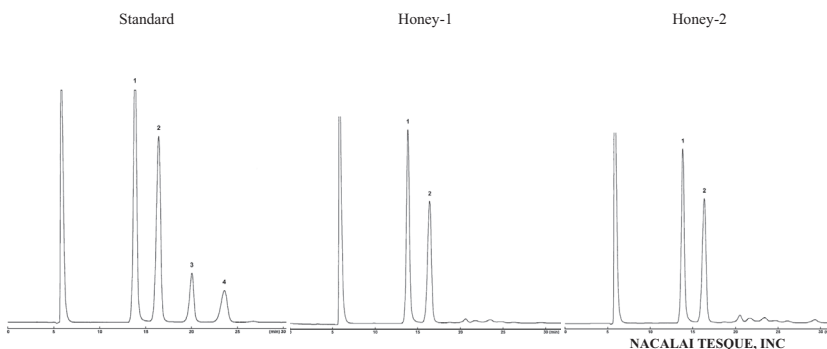
Column: COSMOSIL Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile/ H₂O = 75/25
Flow rate: 0.5 ml/min
Temperature: 30 °C
Detection: RI

Sample: Honey (50mg/ml)

Standard

1; D-(-)-Fructose (30mg/ml)
2; D-(+)-Glucose (24mg/ml)
3; Sucrose (6mg/ml)
4; Maltose (6mg/ml)

Test solution: Acetonitrile/ H₂O = 40/60
Inj. Vol.: 15µl

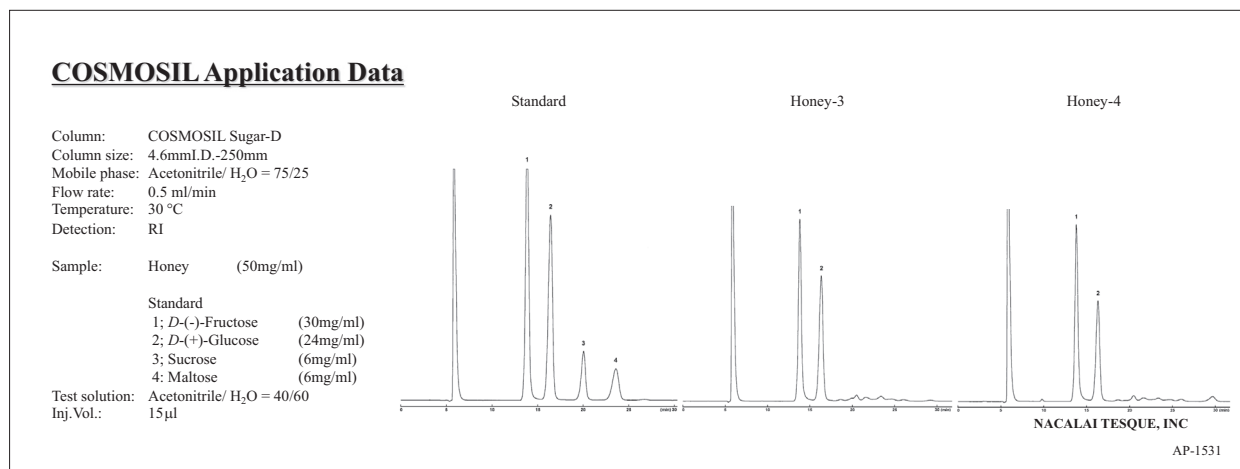


NACALAI TESQUE, INC

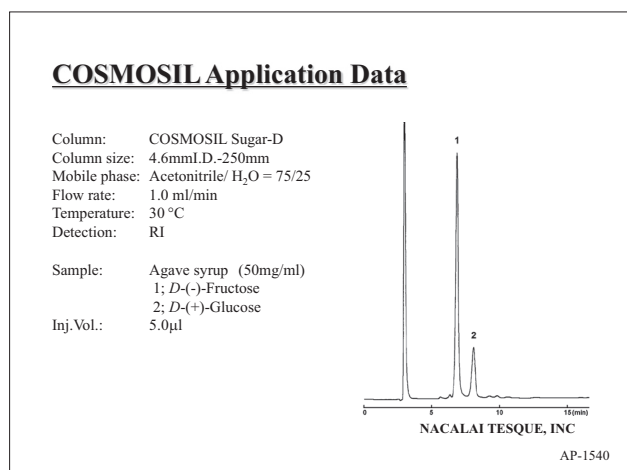
AP-1530

Sugars in Honey and Syrup

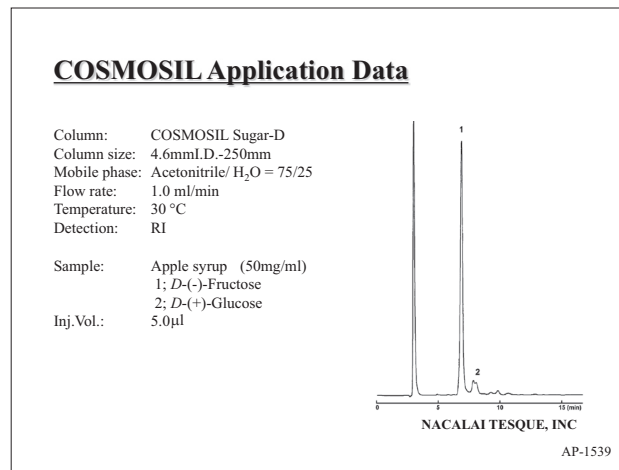
• Honey



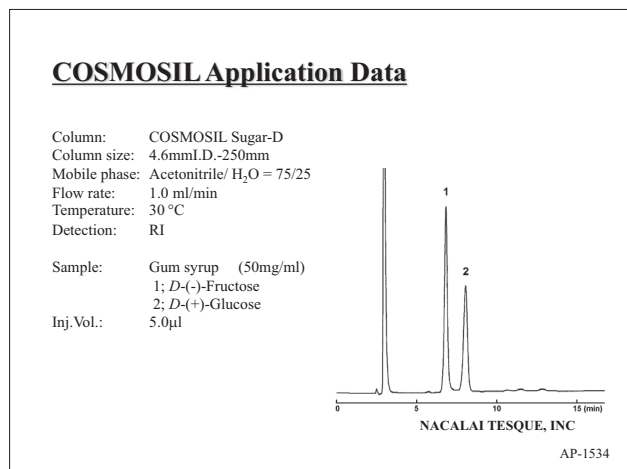
• Agave Syrup



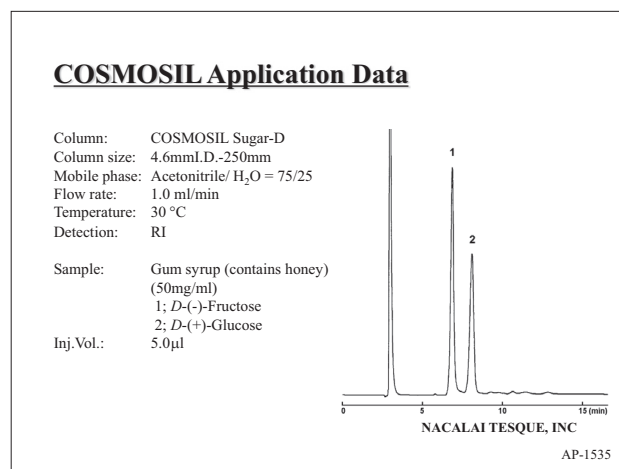
• Apple Syrup



• Gum Syrup

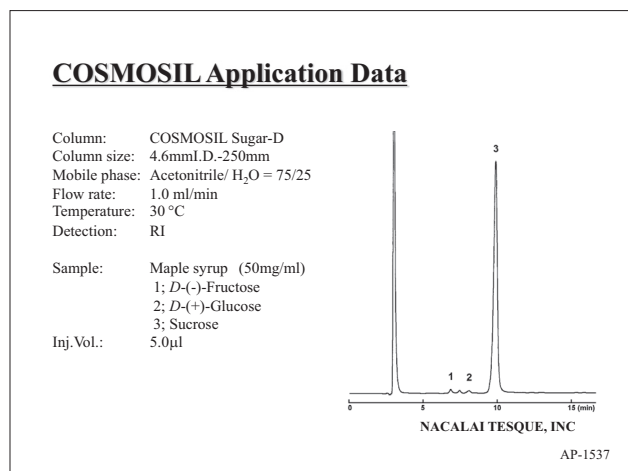


• Gum Syrup with Honey

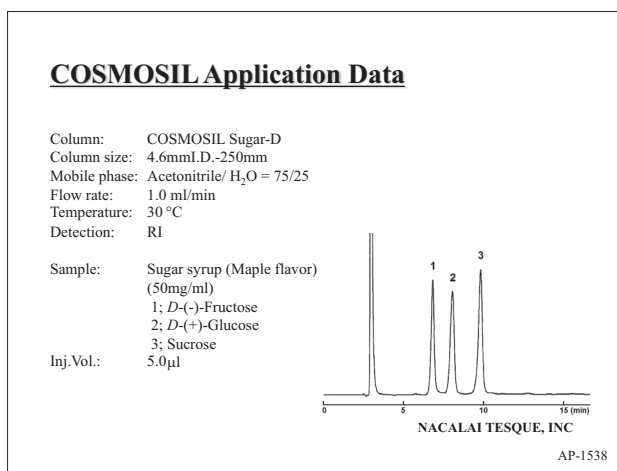


Sugars in Honey and Syrup

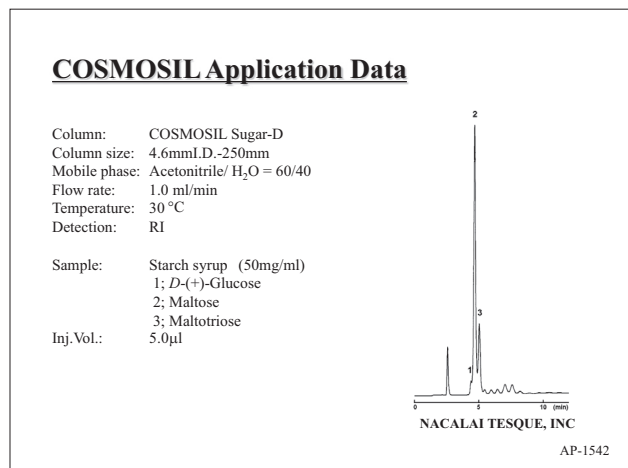
• Maple Syrup



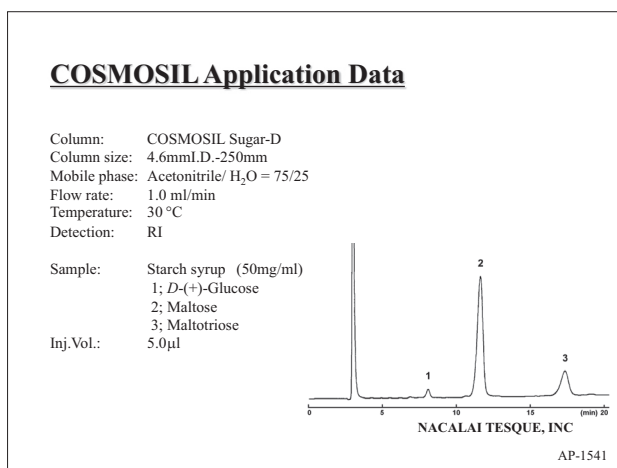
• Maple-Flavored Sugar Syrup



• Starch Syrup

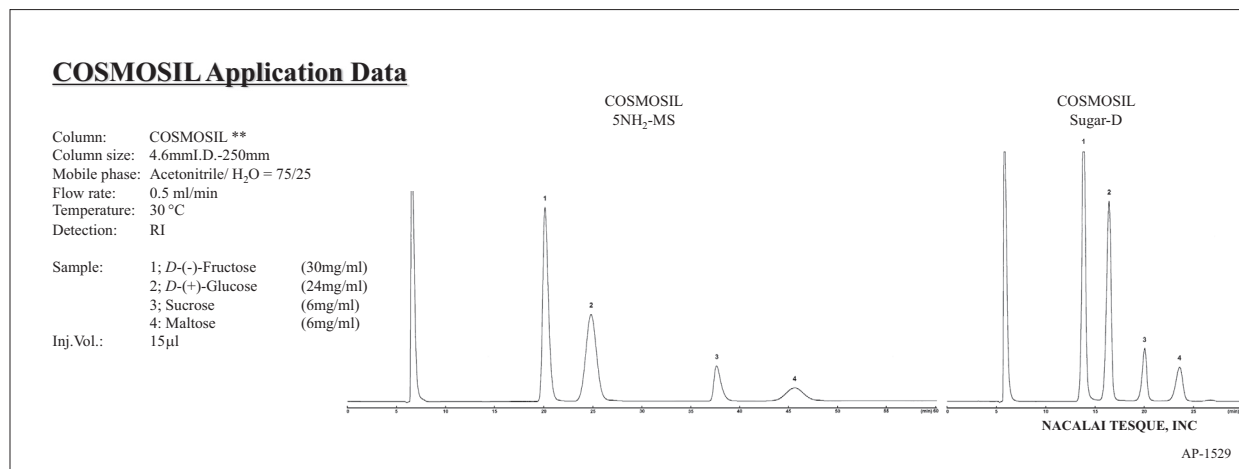


• Starch Syrup



Mono-, Di-, and Oligosaccharides

• Mono- and Disaccharides

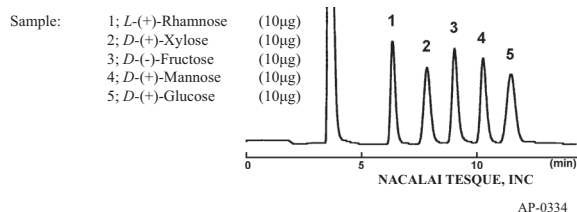


Mono-, Di-, and Oligosaccharides

• Mono- and Disaccharides

COSMOSIL Application Data

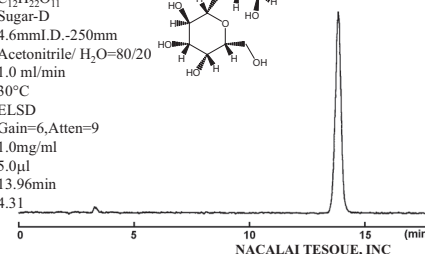
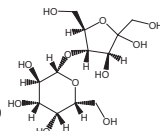
Column: Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile / H₂O = 80/20
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: RI



• Lactulose

COSMOSIL Chromatogram Index

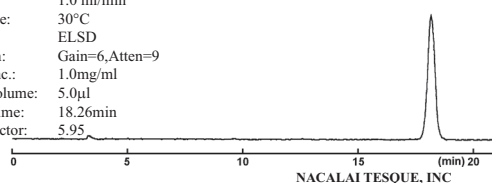
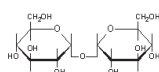
Sample: Lactulose
CAS No.: [4618-18-2]
Molecular formula: C₁₂H₂₂O₁₁
Column: Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile/ H₂O=80/20
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: ELSD
Attenuation: Gain=6,Atten=9
Sample conc.: 1.0mg/ml
Injection volume: 5.0µl
Retention time: 13.96min
Capacity factor: 4.31



• D-Trehalose

COSMOSIL Chromatogram Index

Sample: D-(+)-Trehalose
CAS No.: [6138-23-4]
Molecular formula: C₁₂H₂₂O₁₁
Column: Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile/ H₂O=80/20
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: ELSD
Attenuation: Gain=6,Atten=9
Sample conc.: 1.0mg/ml
Injection volume: 5.0µl
Retention time: 18.26min
Capacity factor: 5.95



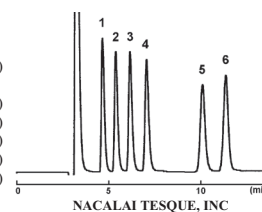
• Sugar Alcohols

COSMOSIL Application Data

Column: Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile / H₂O = 75/25
Flow rate: 1.0 ml/min
Temperature: 30°C
Detection: RI

Sample:

1; Glycerol	(10 µg)
2; meso-Erythritol	(10 µg)
3; Xylitol	(10 µg)
4; D-Glucitol	(10 µg)
5; Maltitol	(10 µg)
6; myo-Inositol	(10 µg)



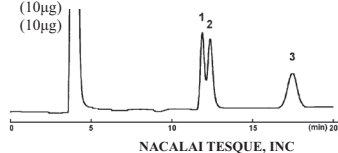
• Monosaccharides and Sugar Alcohols

COSMOSIL Application Data

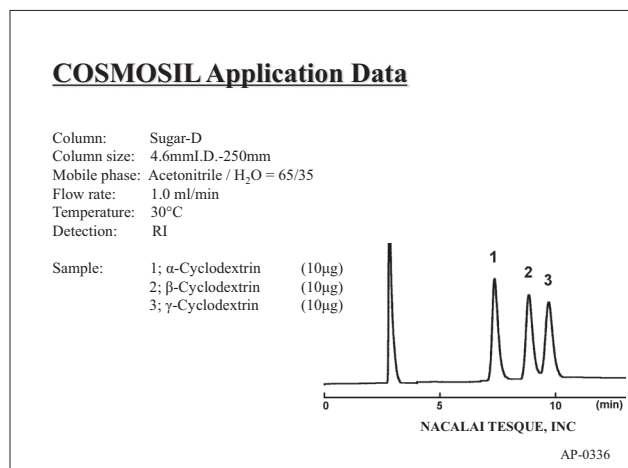
Column: Sugar-D
Column size: 4.6mmI.D.-250mm
Mobile phase: Acetonitrile / H₂O = 85/15
Flow rate: 1.0 ml/min
Temperature: 50°C
Detection: RI

Sample:

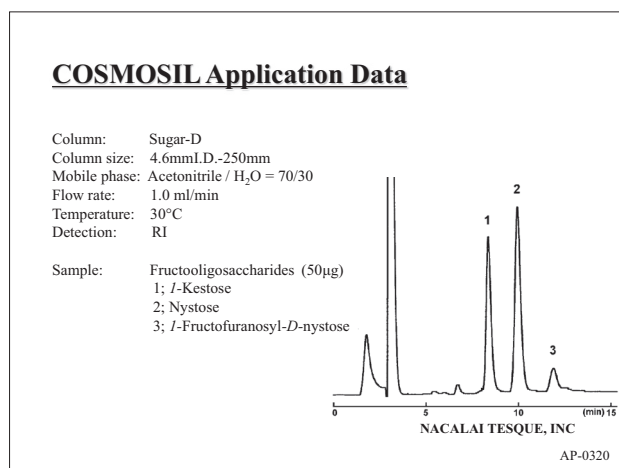
1; Xylitol	(10µg)
2; D-(-)-Fructose	(10µg)
3; D-(+)-Glucose	(10µg)



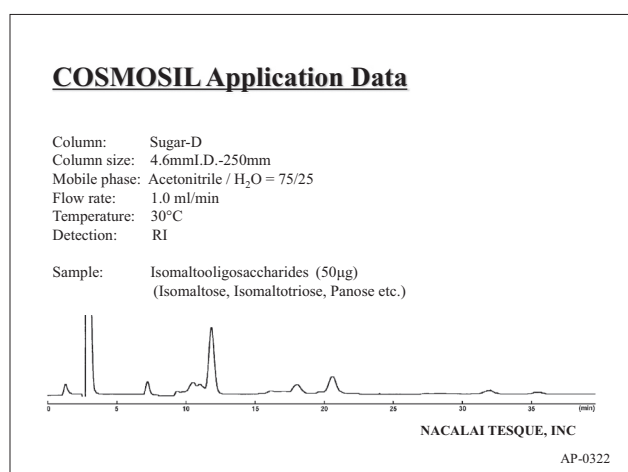
• **Cyclodextrin**



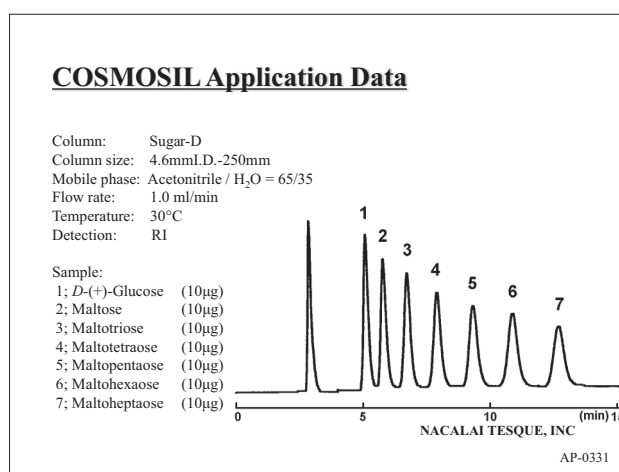
• **Fructooligosaccharides**



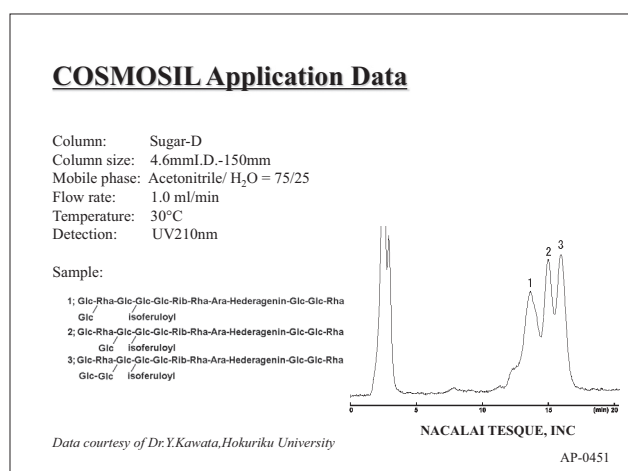
• **Isomaltooligosaccharides**



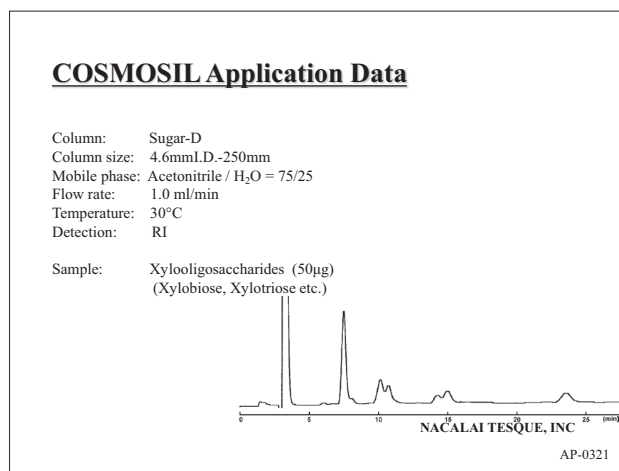
• **Maltooligosaccharides**



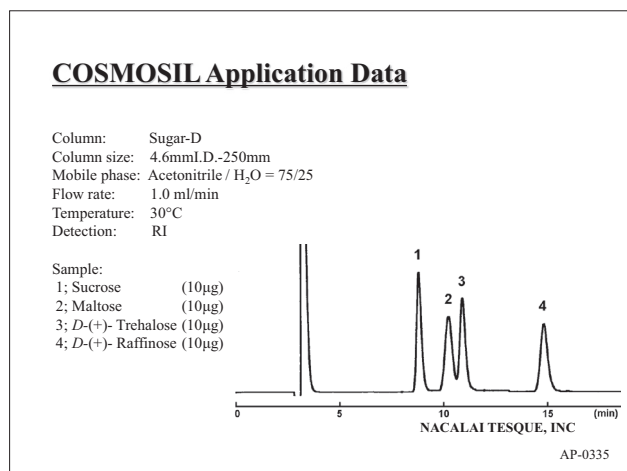
• **Saponin**



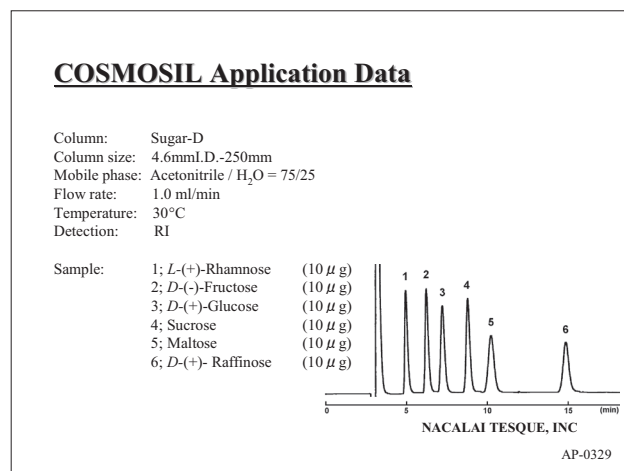
• **Xylooligosaccharides**



• Oligosaccharides



• Oligosaccharides



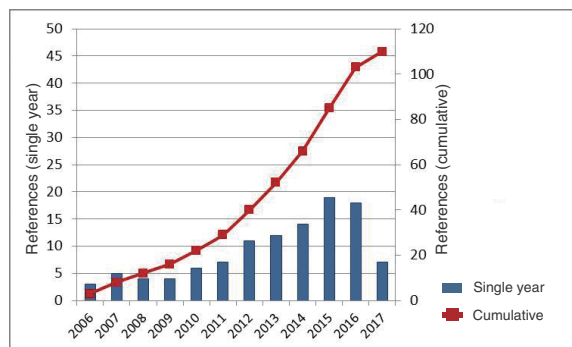
INDEX

	Sample Name	Page
A	Acarbose	6
	D-(+)-Allose	7
	D-Altrose	7
C	Cisplatin [CDDP]	6
	α-Cyclodextrin	14
	β-Cyclodextrin	14
	γ-Cyclodextrin	14
D	Dulcitol [Galactitol]	7
E	meso-Erythritol [meso-Erythrite]	9,13
F	1-Fructofuranosyl-D-nystose	14
	Fructose	2,3,5
	D-(-)-Fructose	7,9,10,11,12,13,15
G	D-Glucitol	9,13
	Glucose	2,3,4,5,17
	D-(+)-Glucose	7,9,10,11,12,13,14,15
	Glycerol	13
	Guanosine	6
	L-Gulose	8
I	myo-Inositol	9,13
	Isomaltooligosaccharides (Isomaltose, Isomaltotriose, Panose etc.)	14
K	1-Kestose	14
L	Lactose	2,9
	Lactulose	13
M	Maltitol	9,10,13
	Maltoheptaose	14
	Maltohexaose	14
	Maltopentaose	14
	Maltose	2,4,9,10,11,12,14,15,17
	Maltotetraitol	10
	Maltotetraose	14

	Sample Name	Page
M	Maltotriitol	9,10
	Maltotriose	9,12,14
	D-(-)-Mannitol	10
	Mannose	2,3,5
	D-(+)-Mannose	13
	Matrine	6
N	Nystose	14
O	Oxymatrine	6
P	Palatinin	10
	Palatinose	9
	D-Psicose	7,8
R	D-(+)-Raffinose	6,15
	Rebaudioside A	6
	Rhamnose	2,3,5
	L-(+)-Rhamnose	13,15
S	Saponin	14
	L-(-)-Sorbose	8
	Stachyose	6
	Stevioside	6
	Sucrose	2,7,9,10,11,12,15
T	D-(-)-Tagatose	8
	D-Talitol	8
	Trehalose	2
	D-(+)-Trehalose	13,15
	Turanose	2
X	Xylitol	9,10,13
	Xylooligosaccharides (Xylobiose, Xylotriose etc.)	14
	Xylose	2,3,5
	D-(+)-Xylose	13

Literature References

Since its introduction in 2004, Sugar-D has become the column of choice for many researchers in sugar analysis. As of February 2017, there are over 100 references for Sugar-D (searched using Google Scholar).



Some recent references are listed below. Please note that we cannot distribute copies of these due to copyright.

TITLE	AUTHOR	JOURNAL	ISSUE	PAGE	YEAR
Effects of ciceritol from chickpeas on human colonic microflora and the production of short chain fatty acids by in vitro fermentation	Yun Zhang, Di Su, Jinyan He, Zhuqing Dai, Riaz Asad, Shiyi Ou, Xiaoxiong Zeng	LWT - Food Science and Technology	79	294–299	2017
Effects of pyruvate kinase on the growth of <i>Corynebacterium glutamicum</i> and L-serine accumulation	Xiaomei Zhang, Lianhe Lai, Guoqiang Xu, Xiaojuan Zhang, Jinsong Shi, Zhenghong Xu	Process Biochemistry	55	32-40	2017
Improving special hydrolysis characterization into <i>Talaromyces thermophilus</i> F1208 xylanase by engineering of N-terminal extension and site-directed mutagenesis in C-terminal	Qin Li, Baoguo Sun, Ke Xiong, Chao Teng, Youqiang Xu, Liangjun Li, Xiuting Li	International Journal of Biological Macromolecules	96	451–458	2017
Enhancement of fructose utilization from sucrose in the cell for improved L-serine production in engineered <i>Corynebacterium glutamicum</i>	Xiaomei Zhang, Liping Yao, Guoqiang Xu, Jiafen Zhu, Xiaojuan Zhang, Jinsong Shi, Zhenghong Xu	Biochemical Engineering Journal	118	113–122	2017
Promoted isomerization of aldoses to ketoses in subcritical aqueous acetonitrile	Da-Ming Gao, Takashi Kobayashi, Shuji Adachi	The Canadian Journal of Chemical Engineering	95 (2)	359-363	2017
<i>Bacillus subtilis</i> iolU encodes an additional NADP+-dependent scyllo-inositol dehydrogenase	Dong-Min Kang, Kosei Tanaka, Shinji Takenaka, Shu Ishikawa & Ken-ichi Yoshida	Bioscience, Biotechnology, and Biochemistry	81 (5)	1026-1032	2017
Evaluation of the chemical quality of Sekkoku (石斛) in current Japanese commercial crude drugs: constituents of <i>Flickingeria xantholeuca</i> (Rchb. f.) A.D. Hawkes	Mei Muto, Haruka Asahina, Tatsufumi Yoshioka, Kazuo Ozaki, Makio Shibano	Journal of Natural Medicines	71 (1)	238–248	2017
d-Pinitol in Fabaceae: an Oviposition Stimulant for the Common Grass Yellow Butterfly, <i>Eurema mandarina</i>	Shin-ya Mukae, Toshiki Ohashi, Yuika Matsumoto, Shinji Ohta, Hisashi Ômura	Journal of Chemical Ecology	42 (11)	1122–1129	2016
Decomposition Kinetics of Glucose and Fructose in Subcritical Water Containing Sodium Chloride	Takashi Kobayashi, Pramote Khuwijitjaru, Shuji Adachi	Journal of Applied Glycoscience	63 (4)	99-104	2016
Efficient and environmental-friendly dehydration of fructose to 5-hydroxymethyl-2-furfural in water under high pressure of CO ₂	Suguru Motokucho, Hiroshi Morikawa, Hisayuki Nakatani, Bart A.J. Noorder	Tetrahedron Letters	57 (42)	4742–4745	2016
Enzymatic synthesis of novel oligosaccharides from N-acetylsucrosamine and melibiose using <i>Aspergillus niger</i> α-galactosidase, and properties of the products	Yohei Sakaki, Mitsuru Tashiro, Moe Katou, Chiseko Sakuma, Takako Hirano, Wataru Hakamata & Toshiyuki Nishio	Bioscience, Biotechnology, and Biochemistry	80 (9)	1836-1842	2016
Investigation of the transglycosylation potential of β-Galactosidase from <i>Aspergillus oryzae</i> in the presence of the ionic liquid [Bmim][PF ₆]	Regina Brakowski, Katrin Pontius, Matthias Franzreb	Journal of Molecular Catalysis B: Enzymatic	130	48–57	2016
Analysis of Dissolved Organic Nutrients in the Interstitial Water of Natural Biofilms	Yuki Tsuchiya, Shima Eda, Chiho Kiriya, Tomoya Asada, Hisao Morisaki	Microbial Ecology	72 (1)	85-95	2016
Physicochemical parameters, bioactive compounds and microbial quality of sonicated pear juice	Muhammad Saeeduddin, Muhammad Abid, Saqib Jabbar, Bing Hu, Malik Muhammad Hashim, Muhammad Ammar Khan, Minhao Xie, Tao Wu, Xiaoxiong Zeng	Food Science + Technology	51 (7)	1552–1559	2016

For research use only, not intended for diagnostic or drug use.