COMPOSITION OF SWEET CHERRY JUICE

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Presented at the 128th International Meeting of AOAC International, September 9, 2014, Boca Raton FL

Abstract

Samples of commercial sweet cherry juice, puree and concentrate were analyzed to produce an analytical profile for the authentication of commercial sweet cherry juice. After removal of a few extreme outliers, the data consisted of 42 samples. The following profile (mean, standard deviation, normalized to 20 °Brix) was obtained from these data for commercial sweet cherry juice: fructose (g/100g) 6.13, 0.40, glucose (g/100g, glucose values include the sorbitol) 10.78, 0.79, sucrose (g/100g) 0.00, 0.01, sorbitol (g/100g) 3.30, 0.58, acidity (g/100g as malic acid) 0.680. 0.111, citric acid (g/100g) 0.018, 0.022, malic acid (g/100g) 0.766, 0.144, quinic acid (g/100g) 0.028, 0.032, fumaric acid (mg/kg) 10.8, 8.4, potassium (mg/kg) 2970, 200, proline (mg/kg) 54, 88, formol value (meq/100g) 2.93, 0.52, 13C/12C ratio (o/oo PDB) -26.0, 0.6. No maltose, D-malic acid or tartaric acid, were detected in any of the samples. The anthocyanin profile generally consisted of one major peak, corresponding to cyanidin rutinoside, and three minor peaks corresponding to cyanidin glucoside, peonidin rutinoside and peonidin glucoside.

Introduction

Sweet cherry (Prunus Avium) is a species of cherry native to Europe, North Africa and Western Asia. It is an important commercial fruit, grow primarily for the fresh fruit market. The largest producers of sweet cherries are Turkey and the United States, with substantial production also from Iran, China, Italy and Spain. A small portion of sweet cherry production is processed into juice or puree for beverage and food manufacture.

There is not much available literature on the composition of sweet cherry juice. Such data is needed to support efforts to assess the authenticity and purity of commercial sweet cherry juice. Over the last several years, we have analyzed numerous samples of commercial sweet cherry juice for purposes of assessing its authenticity.

After removal of a small number of outlying samples, the data from these analyses have been compiled to produce a compositional guideline for assessing sweet cherry juice. The parameter means and distributions of this database make a good model of authentic sweet cherry juice composition.

Test Methods Used

Carbon Stable Isotope Ratio	Ratio mass spectrometry of CO2 after combustion
Fructose, Glucose, Sucrose	HPLC using aminopropylsilyl type stationary phase
Sorbitol	Colorimetric enzyme assay using sorbitol dehydrogenase
Acidity (as Malic Acid)	Titration
Quinic, Malic, Citric, Tartaric and Fumaric Acids	HPLC using RP C18 type stationary phase
D-Malic Acid	Colorimetric enzyme assay using D-malate dehydrogenase
Potassium	Flame Photometry
Formol Value	Titration of acidity liberated by formaldehyde
Proline	Colorimetry after reaction with ninhydrin
Anthocyanins	Gradient HPLC using RP C18 type stationary phase
Oligosaccharide Profile	Capillary GC of trimethylsilyl derivatives of disaccharides

Composition of Sweet Cherry Juice*

Parameter	Units	Mean	Std. Dev.
Carbon Stable Isotope Ratio	o/oo PDB	-25.99	0.65
Fructose	g/100g	6.13	0.40
Glucose**	g/100g	10.78	0.79
Sucrose	g/100g	0.0 0	0.01
Sorbitol	g/100g	3.30	0.58
Acidity (as Malic Acid)	g/100g	0.680	0.111
Quinic Acid	g/100g	0.028	0.032
Citric Acid	g/100g	0.018	0.022
Fumaric Acid	mg/kg	10.8	8.4
Total Malic Acid	g/100g	0.766	0.144
D-Malic Acid	g/100g	0.00	0.00
Tartaric Acid	g/100g	0.00	0.00
Potassium	mg/kg	2970	200
Formol Value	meq/100mL	2.93	0.52
Proline	mg/kg	54	88

*Based on 42 samples of presumptively authentic commercial sweet cherry juice (data normalized to 20 Brix).
**Glucose values include sorbitol, which is not resolved by the hplc sugar analysis procedure.

Anthocyanins - one major peak, corresponding to cyanidin rutinoside, and three minor peaks corresponding to cyanidin glucoside, peonidin rutinoside and peonidin glucoside

Oligosaccharide Profile - No hydrolyzed inulin or starch peaks, invert sugar peaks can be produced from heating

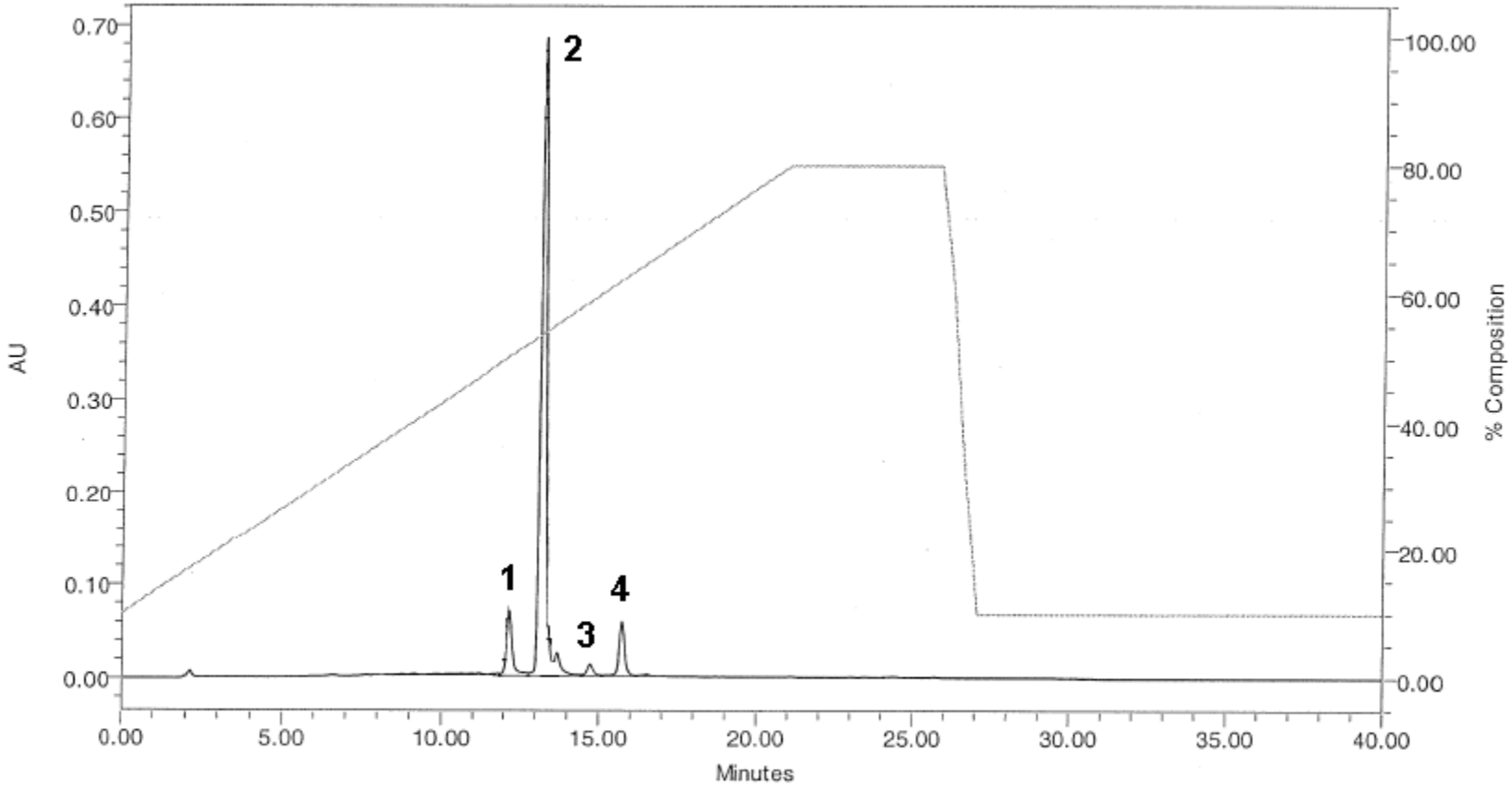
Conclusions:

The composition of sweet cherry juice is very consistent, displaying little variability due to variety or geographic origin

Sweet cherry differs from sour cherry (on an equal Brix basis) principally in having lower acid and malic acid content.

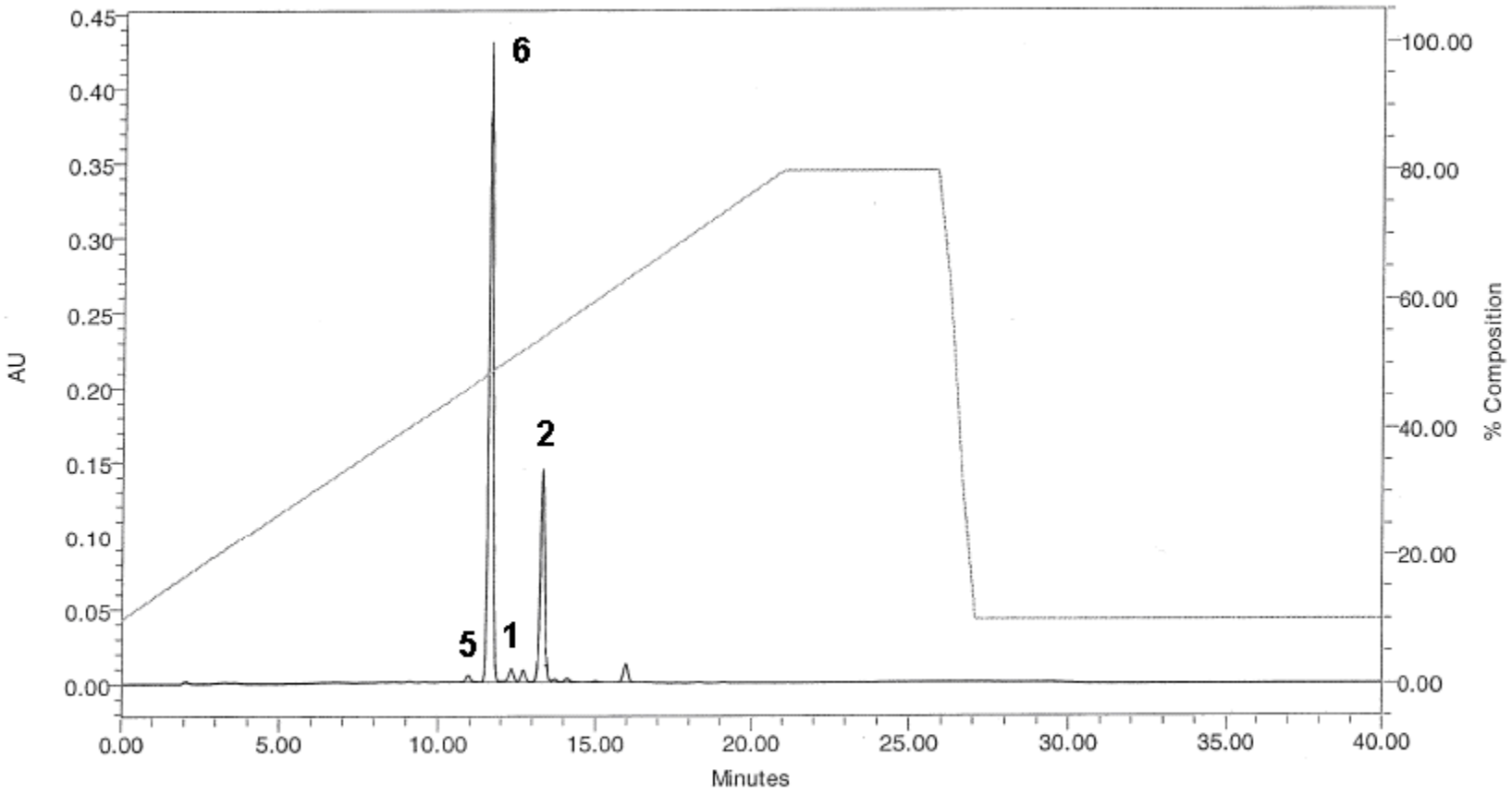
The anthocyanin profile of sweet cherry is missing the major component of sour cherry, cyanidin-3-glucosylrutinoside

Sweet Cherry Anthocyanins



1 cyanidin-3-glucoside, **2** cyanidin-3-rutinoside, **3** peonidin-3-glucoside, **4** peonidin-3-rutinoside

Sour Cherry Anthocyanins



1 cyanidin-3-glucoside, 2 cyanidin-3-rutinoside, **5** cyanidin-3-sophoroside, **6** cyanidin-3-glucosylrutinoside

Method References:

Carbon Stable Isotope Ratio
Official Methods of Analysis of the AOAC, 15th ed. (1990), Method 978.17

Fructose, Glucose, Sucrose
Official Methods of Analysis of the AOAC, 15th ed. (1990), Method 932.14C (10)

Sorbitol
RSK Values - The Complete Manual, 1st ed (1987) Flussiges Obst GmbH (11), p. 142-144

Acidity (as Malic Acid)
Official Methods of Analysis of the AOAC, 15th ed. (1990), Method 942.15B, reported as citric acid.

Quinic Acid, Citric Acid, Malic Acid, Tartaric Acid, Fumaric Acid
Official Methods of Analysis of the AOAC, 15th ed.,(1990), Method 986.13

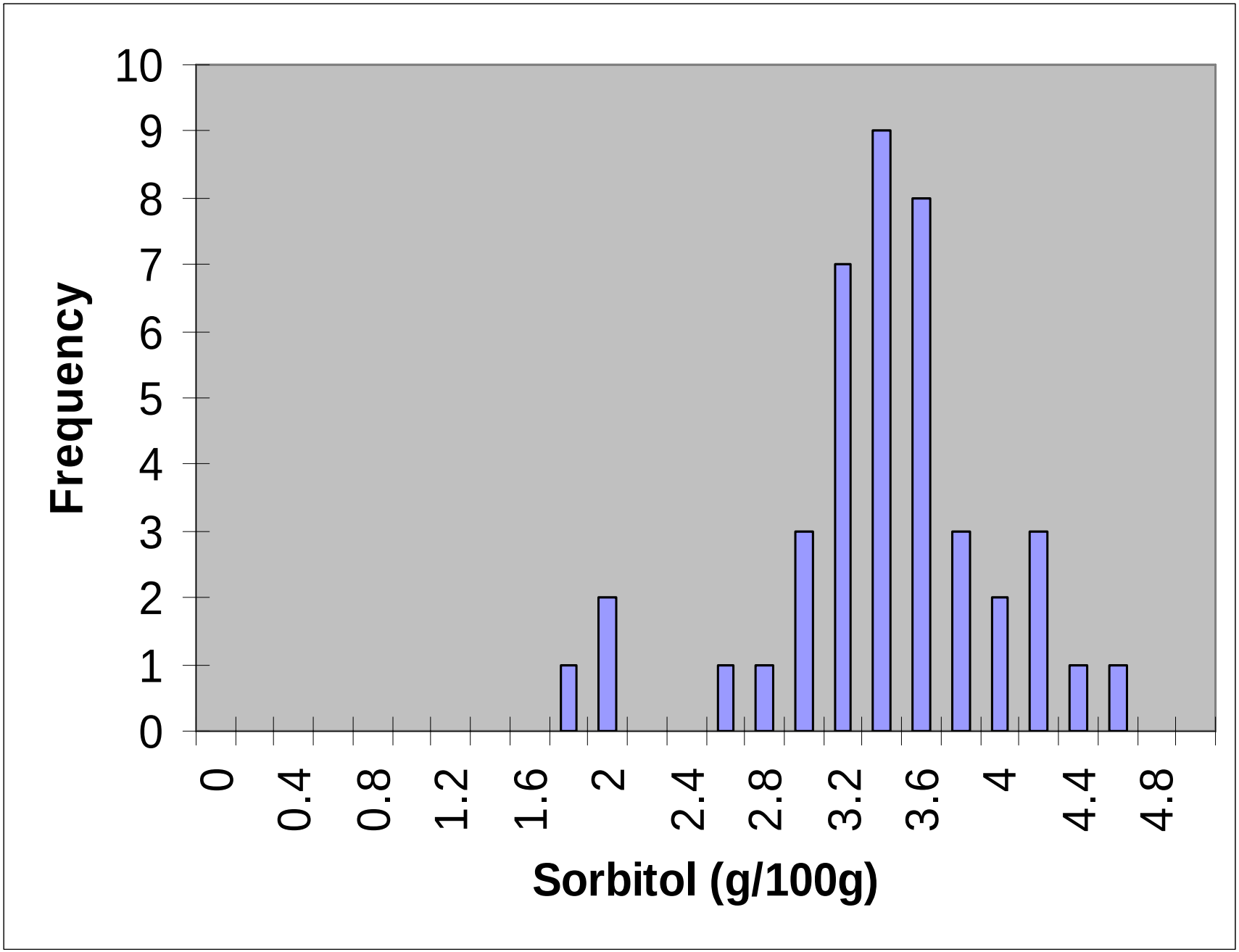
Potassium
Official Methods of Analysis of the AOAC, 15th ed. (1990), Method 965.30

Formol Value
Official Methods of Analysis of the AOAC, 15th ed. (1990), Method 965.31B

Proline
Official Methods of Analysis of the AOAC, 15th ed. (1990), Method 979.20

Anthocyanins
J Food Science v.52 pp.665-6,680 (1987), JAOAC v.70 pp.1036-46 (1987)(sample prep.)

Oligosaccharide Profile
JAOAC Int, (1996) Vol 79, No. 3, 724-737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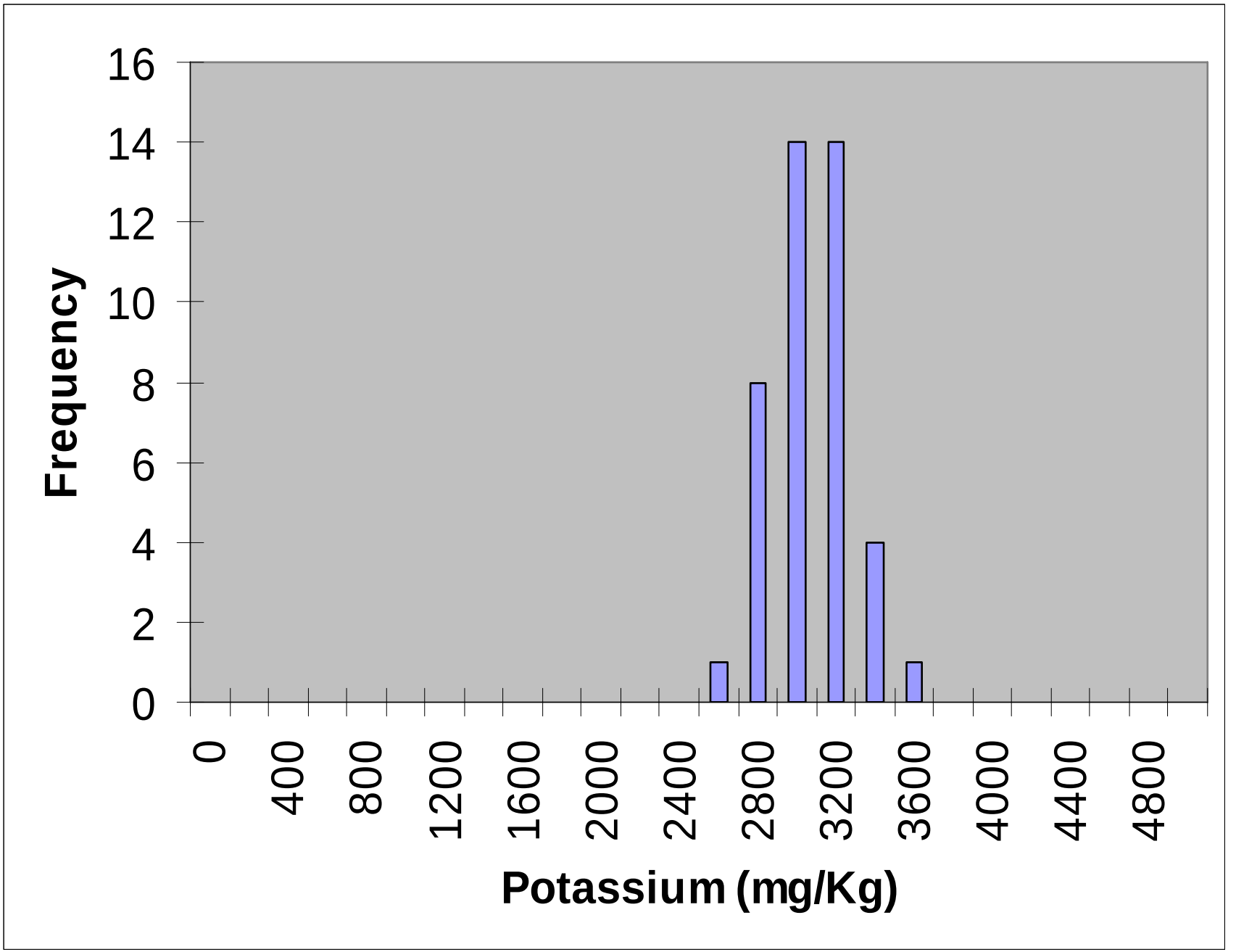
9
8
7
6
5
4
3
2
1
0
0
0.4
0.8
1.2
1.6
2
2.4
2.8
3.2
3.6
4
4.4
4.8
Sorbitol (g/100g)


Frequency
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14
12
10
8
6
4
2
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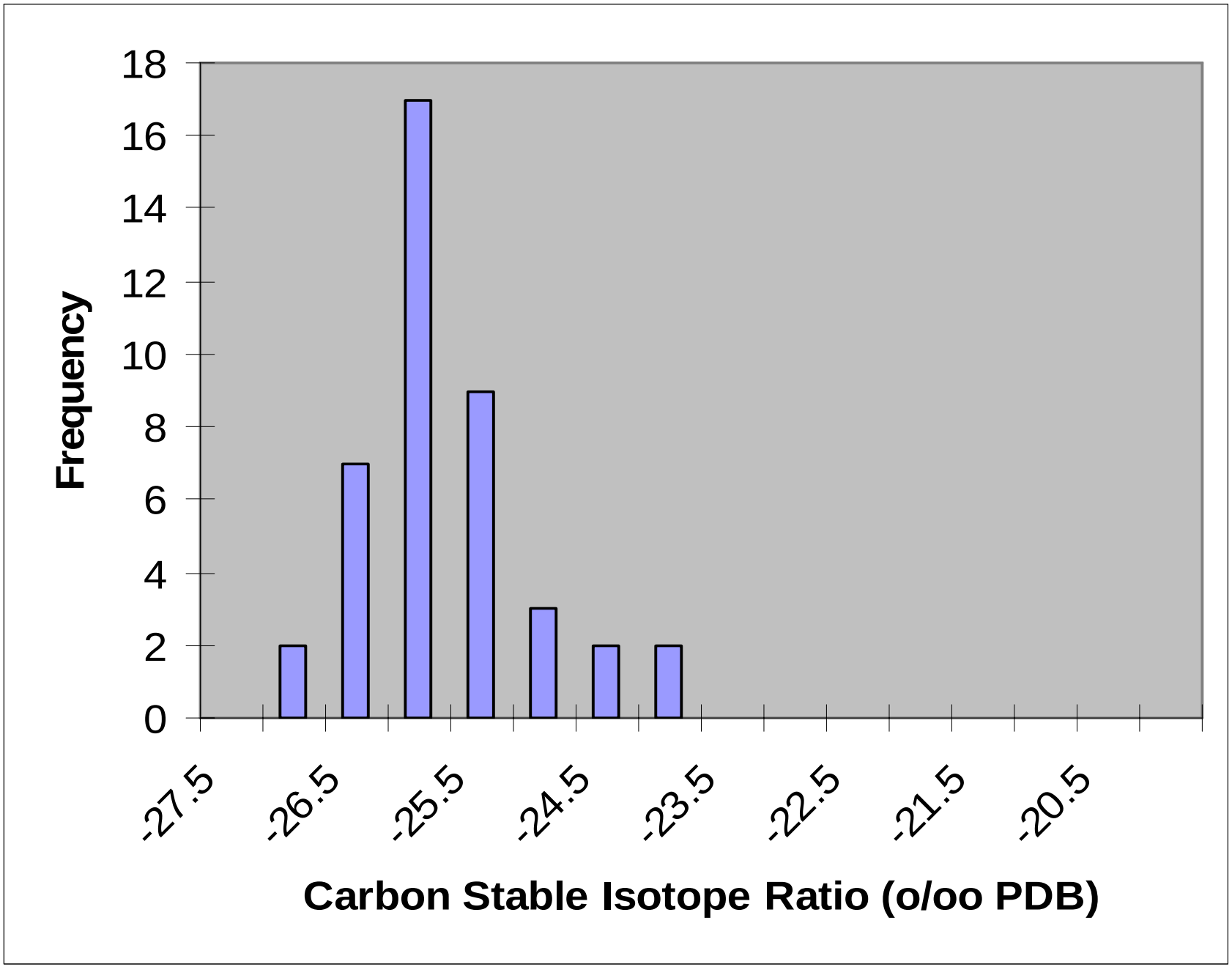
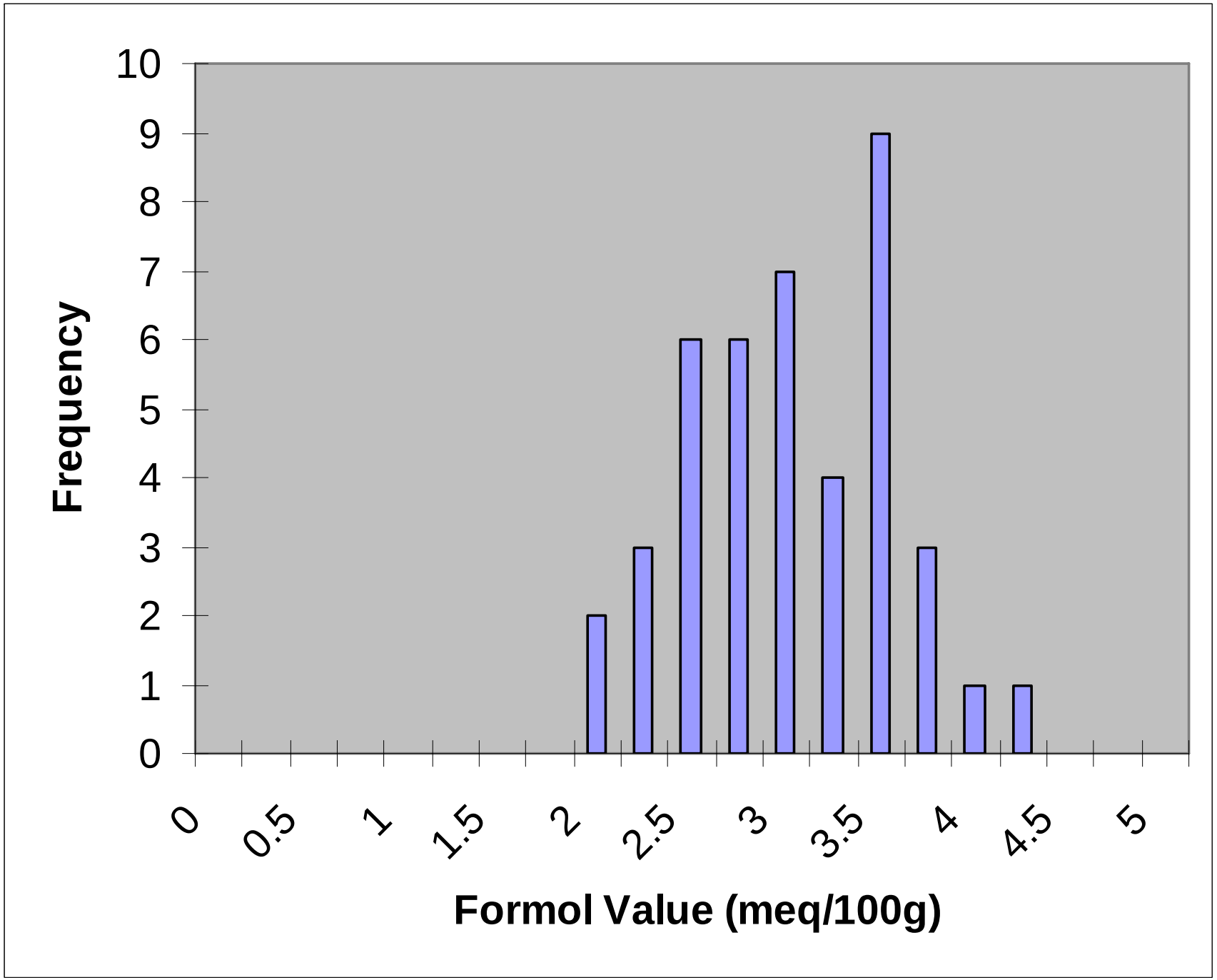
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
4400
4800
Potassium (mg/Kg)


18
16
14
12
10
8
6
4
2
0
Frequency
-27.5
-26.5
-25.5
-24.5
-23.5
-22.5
-21.5
-20.5
Carbon Stable Isotope Ratio (o/oo PDB)


Frequency
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7
6
5
4
3
2
1
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Formol Value (meq/100g)