



المؤسسة العامة القطرية للكهرباء والماء
Qatar General Electricity & Water Corporation

MINERALS IN KAHRAMAA DRINKING WATER AND ITS IMPORTANCE ON CONSUMERS HEALTH AND TASTE

Presented By:

Mariam Mohamed Abdullah

Head of Water Quality Laboratory

Qatar General Electricity & Water Corporation (KAHRAMAA)



- Why do we need Such Study?!

- لماذا نعلم التفكير فى هذه الدراسة؟

Why

لماذا

- KAHRAMAA customer survey run during 2015 indicated that ONLY 30% of KM customers use KM water as drinking water while 70% prefer to use bottled water. The reasons behind such trend were analyzed as any of the following:
 - Individual's perception,
 - Lack of awareness, and
 - Lack of confidence and trust
- أشار استطلاع آراء عملاء كهرباء خلال عام ٢٠١٥ إلى أن ٣٠٪ فقط من العملاء يستخدمون مياه كهرباء كماء للشرب بينما يفضل ٧٠٪ استخدام المياه المعبأة في زجاجات. وتم تحليل الأسباب الكامنة وراء هذا الاتجاه على النحو التالي:
 - القناعات والموروثات الشخصية
 - انعدام أو قلة الوعي بجودة مياه الشرب بكهرباء
 - انعدام أو قلة الثقة بجودة مياه الشرب بكهرباء



- What are the concerned constituents / parameters ?!

- ما هي العوامل التي تم دراستها في هذه الدراسة؟

Main Drivers

- ❑ WHO Guidelines and international standards for the development of such plans.
- ❑ Effective control over the production facilities.
- ❑ Country's entire System Coverage.
- ❑ Strict and comprehensive control over Water Tankers (for areas outside network coverage).

العوامل المأخوذة في الإعتبار

- ❑ المعايير العالمية والقياسية لوضع مثل هذه الخطط (كعدد السكان و كمية المياه المستهلكة إلخ)
- ❑ الرقابة وبشكل فعال على جميع محطات إنتاج المياه.
- ❑ تغطية الخطة لجميع أنحاء ومناطق الدولة التي تتغذى من شبكة المياه.
- ❑ الرقابة الصارمة لصهاريج المياه التي تغذي مناطق الدولة والتي لم تصل شبكة توزيع المياه إليها.

Concerned Parameter

- Important chemical constituents related to consumers health and perceptions of taste in KAHRAMAA supplied water and different commercially available bottled water brands within the Qatari market
- Calcium (Ca), Magnesium (Mg), Sodium (Na), Potassium (K), Chloride (Cl), Copper (Cu), Zinc (Zn), Manganese (Mn), Selenium (Se), Chromium (Cr) and Fluoride (F) .
- Other non-health based constituents like pH, TDS and hardness.

العوامل المأخوذة في الإعتبار

□ المكونات الكيميائية الهامة المتعلقة بصحة المستهلكين والأخرى الخاصة بالمذاق في مياه كهرباء والعديد من العلامات التجارية للمياه المعبأة في زجاجات داخل السوق القطري.

Main Drivers

- ❑ New Studies and Researches.
- ❑ Analysis of Historical Data and continual improvement opportunities.
- ❑ New Projects and Network Extension.
- ❑ Laboratory Competency profile.

العوامل المأخوذة في الإعتبار

- ❑ عمل دراسات دورية ومستمرة لتطوير جودة المياه الموزعة على المشتركين.
- ❑ تقييم الأداء عن السنوات الماضية ووضع آليات للتحسين المستمر.
- ❑ التوسعات الحالية والمستقبلية في شبكة توزيع المياه.
- ❑ قدرات المختبر التقنية والبشرية.

Main Drivers

العوامل المأخوذة فى الإعتبار

- ❑ Applying Fixed and Variable Hydrant concept.

- ❑ تطبيق افضل الممارسات فى تغطية شبكة التوزيع (النقاط الثابتة والمتغيرة).

- ❑ Compliance Assessments and actions as deemed necessary.

- ❑ تقييم مدى جودة مياه الشرب مقارنة بالمتطلبات.

- ❑ Emergency Cases.

- ❑ السيناريوهات المحتملة وخصوصا بحالات الطوارئ.

- ❑ Continual Improvements.

- ❑ التطوير الدائم والمستمر.

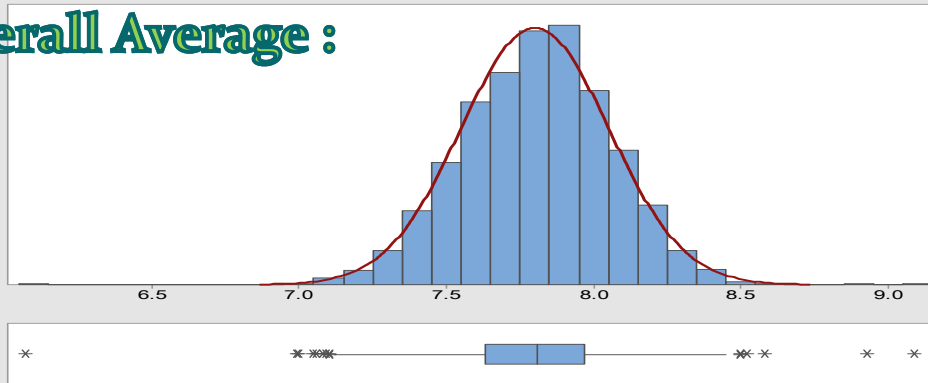


عناصر مياه الشرب بكهرماء

KAHRAMAA Water
Quality Analyzed
Parameters

KAHRAMAA pH Overall Statistics (2013 to 2015)

Overall Average :
7.8



Anderson-Darling Normality Test

A-Squared 1.03
P-Value 0.011

Mean 7.8005
StDev 0.2522
Variance 0.0636
Skewness -0.15601
Kurtosis 1.03993
N 2359

Minimum 6.0700
1st Quartile 7.6300
Median 7.8100
3rd Quartile 7.9700
Maximum 9.0900

95% Confidence Interval for Mean
7.7903 7.8107

95% Confidence Interval for Median
7.8000 7.8200

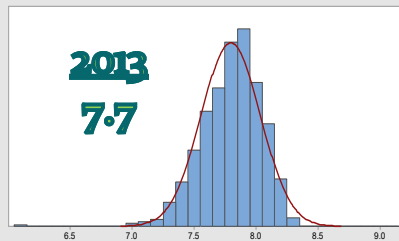
95% Confidence Interval for StDev
0.2452 0.2596

95% Confidence Intervals

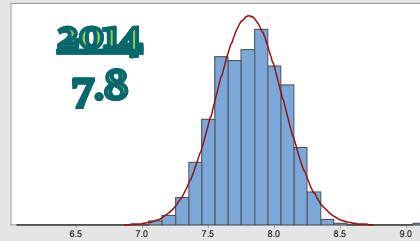


pH Statistics

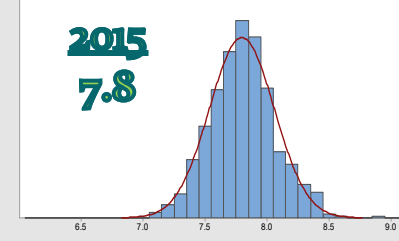
Summary Report for pH Year = 2013



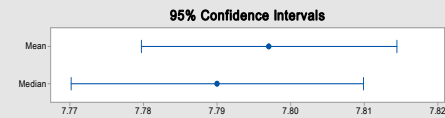
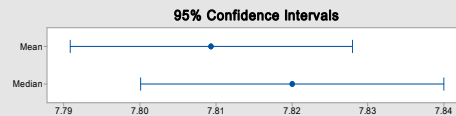
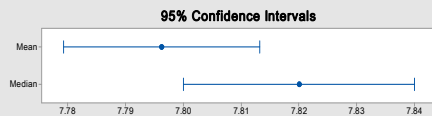
Anderson-Darling Normality Test
A-Squared 1.20
P-Value <0.005
Mean 7.8093
StDev 0.2543
Variance 0.0647
Skewness 0.033143
Kurtosis 0.257433
N 721
Minimum 7.0500
1st Quartile 7.6200
Median 7.8200
3rd Quartile 8.0000
Maximum 9.0900
95% Confidence Interval for Mean
7.7908 7.8279
95% Confidence Interval for Median
7.8000 7.8400
95% Confidence Interval for StDev
0.2418 0.2682



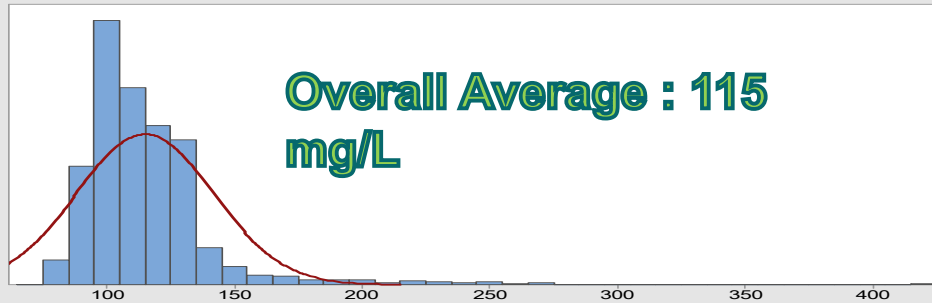
Anderson-Darling Normality Test
A-Squared 0.92
P-Value 0.019
Mean 7.7970
StDev 0.2614
Variance 0.0683
Skewness 0.185910
Kurtosis 0.227891
N 875
Minimum 7.0800
1st Quartile 7.6200
Median 7.7900
3rd Quartile 7.9500
Maximum 8.9300
95% Confidence Interval for Mean
7.7797 7.8144
95% Confidence Interval for Median
7.7701 7.8099
95% Confidence Interval for StDev
0.2497 0.2742



Anderson-Darling Normality Test
A-Squared 1.20
P-Value <0.005
Mean 7.8093
StDev 0.2543
Variance 0.0647
Skewness 0.033143
Kurtosis 0.257433
N 721
Minimum 7.0500
1st Quartile 7.6200
Median 7.8200
3rd Quartile 8.0000
Maximum 9.0900
95% Confidence Interval for Mean
7.7908 7.8279
95% Confidence Interval for Median
7.8000 7.8400
95% Confidence Interval for StDev
0.2418 0.2682



KAHRAMAA TDS Overall Statistics (2013 to 2015)



95% Confidence Intervals



Anderson-Darling Normality Test

A-Squared 111.34
P-Value <0.005

Mean 115.03
StDev 26.90
Variance 723.49
Skewness 3.5602
Kurtosis 23.5643
N 2359

Minimum 73.92
1st Quartile 99.66
Median 108.90
3rd Quartile 124.74
Maximum 418.44

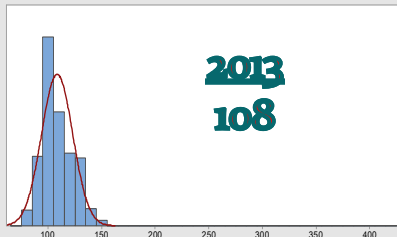
95% Confidence Interval for Mean
113.94 116.11

95% Confidence Interval for Median
108.12 110.22

95% Confidence Interval for StDev
26.15 27.69

TDS Statistics

Summary Report for TDS Year = 2013



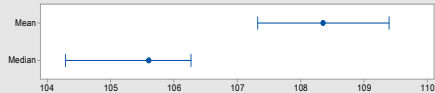
Anderson-Darling Normality Test
A-Squared 11.11
P-Value <0.005
Mean 108.35
StDev 14.55
Variance 211.59
Skewness 0.568315
Kurtosis -0.131201
N 763

Minimum 75.24
1st Quartile 99.00
Median 105.60
3rd Quartile 118.80
Maximum 153.12

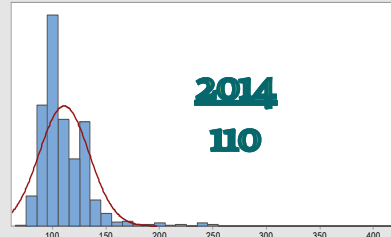
95% Confidence Interval for Mean
107.32 109.39

95% Confidence Interval for Median
104.28 106.26
95% Confidence Interval for StDev
13.85 15.32

95% Confidence Intervals



Summary Report for TDS Year = 2014



Anderson-Darling Normality Test
A-Squared 22.27
P-Value <0.005
Mean 110.86
StDev 22.27
Variance 495.81
Skewness 2.33
Kurtosis 9.00
N 763

Minimum 73.92
1st Quartile 99.66
Median 108.90
3rd Quartile 124.74
Maximum 418.44

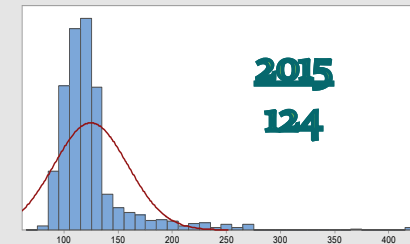
95% Confidence Interval for Mean
108.86 110.86

95% Confidence Interval for Median
102.78 104.78
95% Confidence Interval for StDev
22.27 22.27

95% Confidence Intervals



Summary Report for TDS Year = 2015



Anderson-Darling Normality Test
A-Squared 68.35
P-Value <0.005
Mean 124.51
StDev 34.21
Variance 1170.54
Skewness 3.4244
Kurtosis 18.2139
N 875

Minimum 78.54
1st Quartile 106.26
Median 117.48
3rd Quartile 128.04
Maximum 418.44

95% Confidence Interval for Mean
122.24 126.78

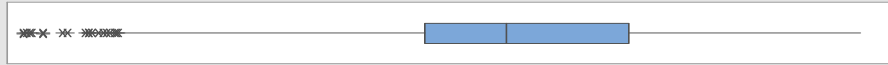
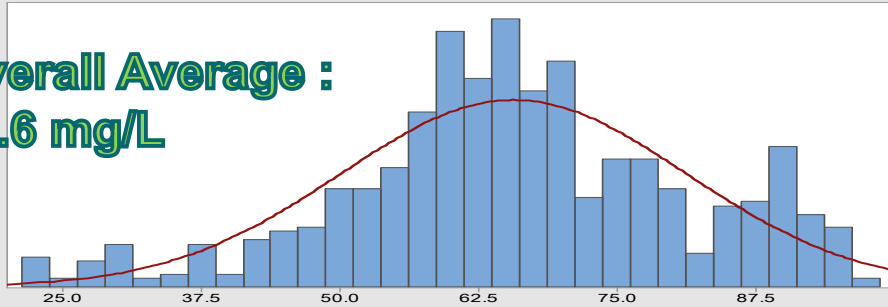
95% Confidence Interval for Median
116.16 118.80
95% Confidence Interval for StDev
32.68 35.90

95% Confidence Intervals

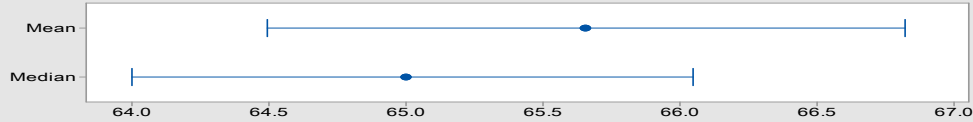


KAHRAMAA Total Hardness Overall Statistics (2013 to 2015)

Overall Average :
65.6 mg/L



95% Confidence Intervals



Anderson-Darling Normality Test

A-Squared 3.32
P-Value <0.005

Mean 65.658
StDev 15.544
Variance 241.606
Skewness -0.286364
Kurtosis 0.119348
N 684

Minimum 21.500
1st Quartile 57.625
Median 65.000
3rd Quartile 76.000
Maximum 97.000

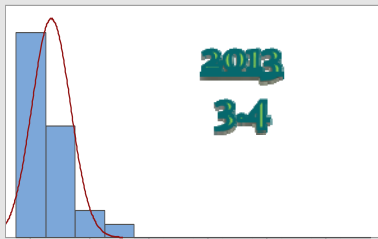
95% Confidence Interval for Mean
64.491 66.825

95% Confidence Interval for Median
64.000 66.049

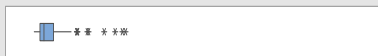
95% Confidence Interval for StDev
14.761 16.414

Total Hardness Statistics

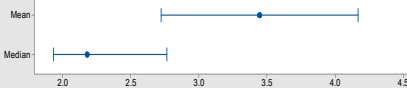
Summary Report for Sodium Year = 2013



2013
3.4



95% Confidence Intervals



Anderson-Darling Normality Test

A-Squared 8.03
P-Value <0.005

Mean 3.4439
StDev 3.2548
Variance 10.5934
Skewness 2.33652
Kurtosis 5.52809
N 80

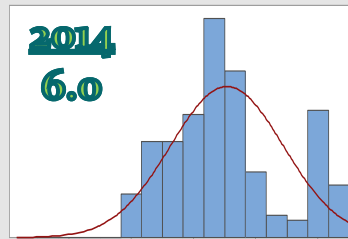
Minimum 0.5000
1st Quartile 1.5550
Median 2.1750
3rd Quartile 3.7975
Maximum 15.9800

95% Confidence Interval for Mean
2.7196 4.1682

95% Confidence Interval for Median
1.9000 2.7622

95% Confidence Interval for StDev
2.8168 3.8552

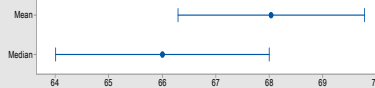
Total Hardness (as CaCO3) Year = 2014



2014
6.0



95% Confidence Intervals



Anderson-Darling Normality Test

A-Squared 4.61
P-Value <0.005

Mean 68.038
StDev 13.597
Variance 184.875
Skewness 0.473219
Kurtosis -0.671689
N 235

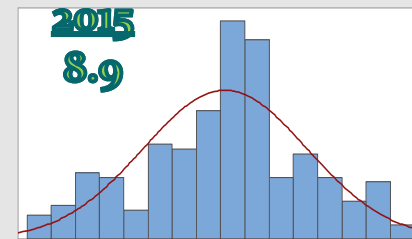
Minimum 46.000
1st Quartile 59.000
Median 66.000
3rd Quartile 76.000
Maximum 97.000

95% Confidence Interval for Mean
66.291 69.786

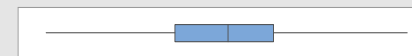
95% Confidence Interval for Median
64.000 68.000

95% Confidence Interval for StDev
12.469 14.951

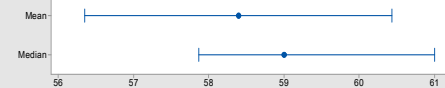
Total Hardness (as CaCO3) Year = 2015



2015
8.9



95% Confidence Intervals



Anderson-Darling Normality Test

A-Squared 1.35
P-Value <0.005

Mean 58.391
StDev 16.919
Variance 286.237
Skewness -0.138611
Kurtosis -0.361305
N 266

Minimum 21.500
1st Quartile 48.000
Median 59.000
3rd Quartile 68.475
Maximum 96.000

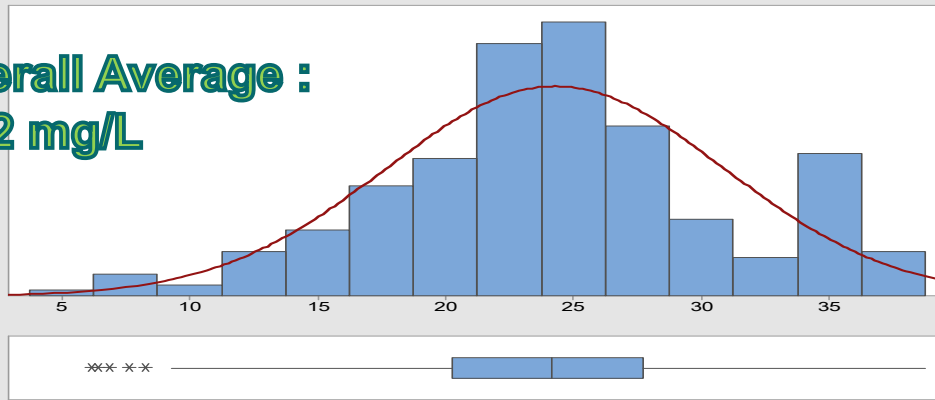
95% Confidence Interval for Mean
56.348 60.433

95% Confidence Interval for Median
57.864 61.000

95% Confidence Interval for StDev
15.593 18.493

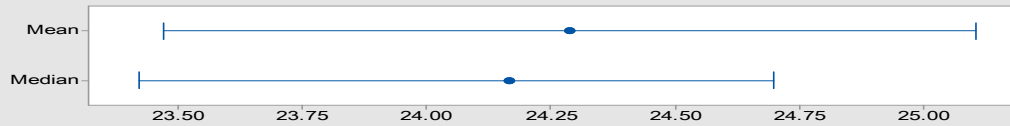
KAHRAMAA Ca Content Overall Statistics (2013 to 2015)

Overall Average :
24.2 mg/L



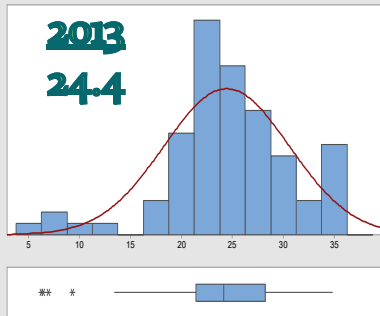
| Anderson-Darling Normality Test | |
|------------------------------------|---------------|
| A-Squared | 1.42 |
| P-Value | <0.005 |
| Mean | 24.288 |
| StDev | 6.626 |
| Variance | 43.901 |
| Skewness | -0.0653492 |
| Kurtosis | 0.0084258 |
| N | 254 |
| Minimum | 6.200 |
| 1st Quartile | 20.263 |
| Median | 24.165 |
| 3rd Quartile | 27.753 |
| Maximum | 38.740 |
| 95% Confidence Interval for Mean | |
| | 23.470 25.107 |
| 95% Confidence Interval for Median | |
| | 23.419 24.697 |
| 95% Confidence Interval for StDev | |
| | 6.095 7.258 |

95% Confidence Intervals



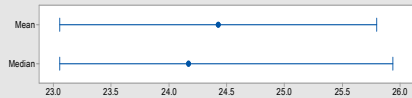
Ca (as Ca)
Statistics

Summary Report for Calcium as Ca Year = 2013

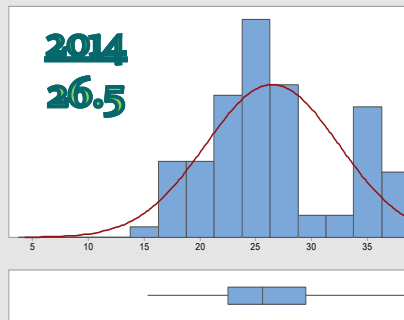


| Anderson-Darling Normality Test | |
|------------------------------------|---------------|
| A-Squared | 1.17 |
| P-Value | <0.005 |
| Mean | 24.424 |
| StDev | 6.169 |
| Variance | 38.057 |
| Skewness | -0.72564 |
| Kurtosis | 1.43271 |
| N | 80 |
| Minimum | 6.200 |
| 1st Quartile | 21.433 |
| Median | 24.165 |
| 3rd Quartile | 28.208 |
| Maximum | 34.800 |
| 95% Confidence Interval for Mean | |
| | 23.051 25.797 |
| 95% Confidence Interval for Median | |
| | 23.055 25.399 |
| 95% Confidence Interval for StDev | |
| | 5.339 7.307 |

95% Confidence Intervals



Summary Report for Calcium as Ca Year = 2014

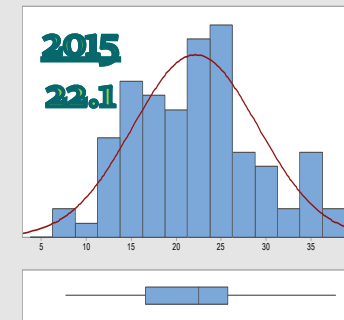


| Anderson-Darling Normality Test | |
|------------------------------------|---------------|
| A-Squared | 1.93 |
| P-Value | <0.005 |
| Mean | 26.462 |
| StDev | 5.971 |
| Variance | 35.650 |
| Skewness | 0.420198 |
| Kurtosis | -0.702952 |
| N | 84 |
| Minimum | 15.330 |
| 1st Quartile | 22.497 |
| Median | 25.610 |
| 3rd Quartile | 29.493 |
| Maximum | 38.740 |
| 95% Confidence Interval for Mean | |
| | 25.166 27.758 |
| 95% Confidence Interval for Median | |
| | 24.557 26.607 |
| 95% Confidence Interval for StDev | |
| | 5.184 7.041 |

95% Confidence Intervals



Summary Report for Calcium as Ca Year = 2015

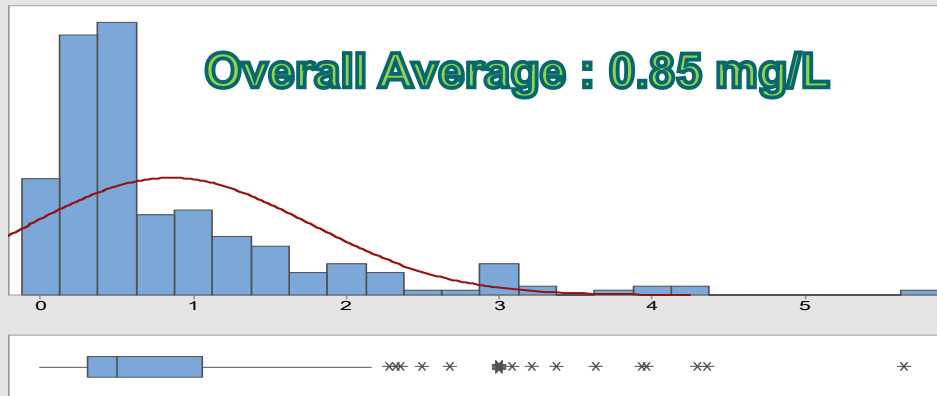


| Anderson-Darling Normality Test | |
|------------------------------------|---------------|
| A-Squared | 0.55 |
| P-Value | 0.151 |
| Mean | 22.139 |
| StDev | 6.973 |
| Variance | 48.620 |
| Skewness | 0.288723 |
| Kurtosis | -0.357542 |
| N | 90 |
| Minimum | 7.660 |
| 1st Quartile | 16.590 |
| Median | 22.495 |
| 3rd Quartile | 25.715 |
| Maximum | 37.740 |
| 95% Confidence Interval for Mean | |
| | 20.678 23.599 |
| 95% Confidence Interval for Median | |
| | 20.367 23.846 |
| 95% Confidence Interval for StDev | |
| | 6.082 8.172 |

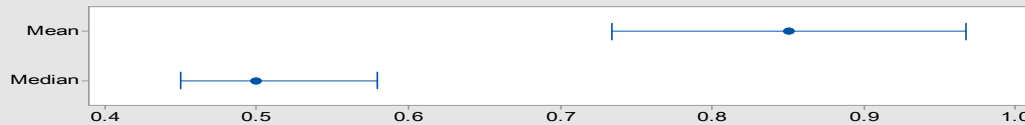
95% Confidence Intervals



KAHRAMAA Mg Content Overall Statistics (2013 to 2015)



95% Confidence Intervals



Anderson-Darling Normality Test

| | |
|-----------|---------|
| A-Squared | 18.00 |
| P-Value | <0.005 |
| Mean | 0.85061 |
| StDev | 0.91396 |
| Variance | 0.83532 |
| Skewness | 2.14978 |
| Kurtosis | 5.35804 |
| N | 240 |

| | |
|--------------|---------|
| Minimum | 0.00000 |
| 1st Quartile | 0.30250 |
| Median | 0.50000 |
| 3rd Quartile | 1.06250 |
| Maximum | 5.65000 |

95% Confidence Interval for Mean

| | |
|---------|---------|
| 0.73439 | 0.96683 |
|---------|---------|

95% Confidence Interval for Median

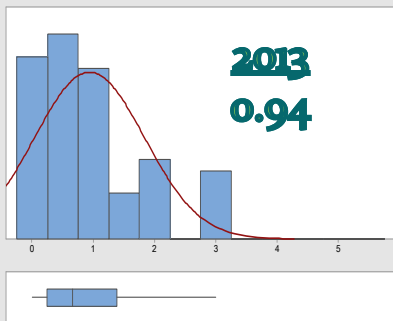
| | |
|---------|---------|
| 0.45000 | 0.58000 |
|---------|---------|

95% Confidence Interval for StDev

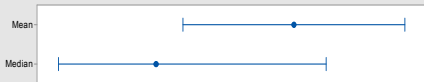
| | |
|---------|---------|
| 0.83885 | 1.00395 |
|---------|---------|

Mg (Magnesium) Statistics

Summary Report for Magnesium as mg Year = 2013



95% Confidence Intervals



Anderson-Darling Normality Test

| | |
|-----------|---------|
| A-Squared | 2.72 |
| P-Value | <0.005 |
| Mean | 0.93530 |
| StDev | 0.89665 |
| Variance | 0.80936 |
| Skewness | 1.04278 |
| Kurtosis | 0.25132 |
| N | 66 |

| | |
|--------------|---------|
| Minimum | 0.00000 |
| 1st Quartile | 0.23750 |
| Median | 0.60000 |
| 3rd Quartile | 1.38750 |
| Maximum | 3.00000 |

95% Confidence Interval for Mean

| | |
|---------|---------|
| 0.71414 | 1.15646 |
|---------|---------|

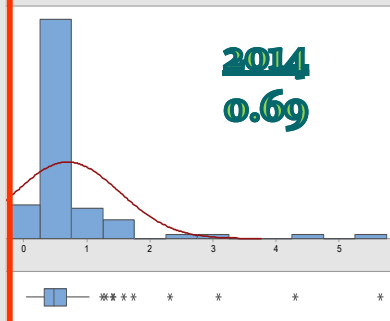
95% Confidence Interval for Median

| | |
|---------|---------|
| 0.46601 | 1.00000 |
|---------|---------|

95% Confidence Interval for StDev

| | |
|---------|---------|
| 0.76807 | 1.08604 |
|---------|---------|

Summary Report for Magnesium as mg Year = 2014



95% Confidence Intervals



Anderson-Darling Normality Test

| | |
|-----------|---------|
| A-Squared | 12.12 |
| P-Value | <0.005 |
| Mean | 0.68810 |
| StDev | 0.82698 |
| Variance | 0.68389 |
| Skewness | 4.0969 |
| Kurtosis | 19.5954 |
| N | 84 |

| | |
|--------------|---------|
| Minimum | 0.03000 |
| 1st Quartile | 0.32000 |
| Median | 0.47000 |
| 3rd Quartile | 0.67500 |
| Maximum | 5.65000 |

95% Confidence Interval for Mean

| | |
|---------|---------|
| 0.50863 | 0.86756 |
|---------|---------|

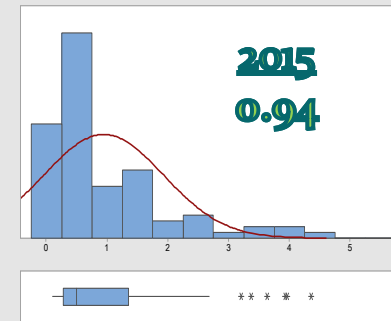
95% Confidence Interval for Median

| | |
|---------|---------|
| 0.40720 | 0.51000 |
|---------|---------|

95% Confidence Interval for StDev

| | |
|---------|---------|
| 0.71806 | 0.97516 |
|---------|---------|

Summary Report for Magnesium as mg Year = 2015



95% Confidence Intervals



Anderson-Darling Normality Test

| | |
|-----------|---------|
| A-Squared | 6.50 |
| P-Value | <0.005 |
| Mean | 0.94019 |
| StDev | 0.98788 |
| Variance | 0.97591 |
| Skewness | 1.72377 |
| Kurtosis | 2.60252 |
| N | 90 |

| | |
|--------------|---------|
| Minimum | 0.10000 |
| 1st Quartile | 0.27750 |
| Median | 0.49500 |
| 3rd Quartile | 1.35250 |
| Maximum | 4.36000 |

95% Confidence Interval for Mean

| | |
|---------|---------|
| 0.73328 | 1.14710 |
|---------|---------|

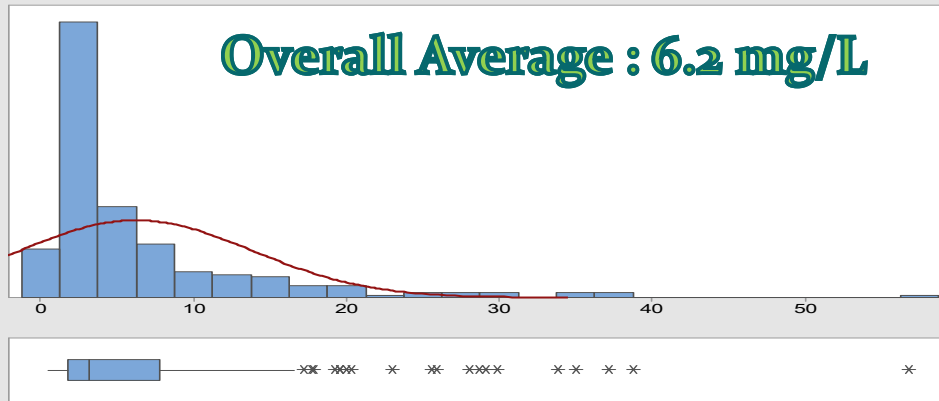
95% Confidence Interval for Median

| | |
|---------|---------|
| 0.39000 | 0.71000 |
|---------|---------|

95% Confidence Interval for StDev

| | |
|---------|---------|
| 0.86164 | 1.15780 |
|---------|---------|

KAHRAMAA Na Content Overall Statistics (2013 to 2015)

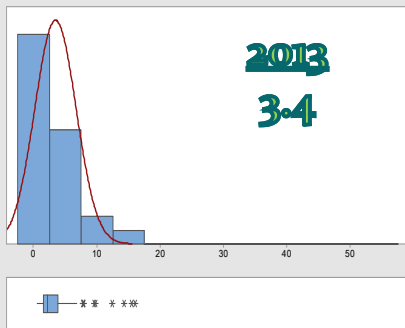


| Anderson-Darling Normality Test | |
|------------------------------------|---------------|
| A-Squared | 26.29 |
| P-Value | <0.005 |
| Mean | 6.2328 |
| StDev | 7.6095 |
| Variance | 57.9044 |
| Skewness | 2.8967 |
| Kurtosis | 10.9835 |
| N | 254 |
| Minimum | 0.5000 |
| 1st Quartile | 1.8275 |
| Median | 3.2150 |
| 3rd Quartile | 7.7950 |
| Maximum | 56.7500 |
| 95% Confidence Interval for Mean | |
| | 5.2925 7.1731 |
| 95% Confidence Interval for Median | |
| | 2.7537 3.8453 |
| 95% Confidence Interval for StDev | |
| | 7.0003 8.3357 |

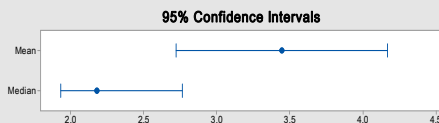


Na (Sodium) Statistics

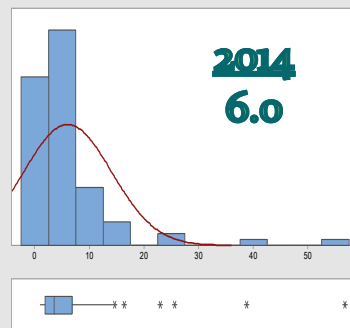
Summary Report for Sodium Year = 2013



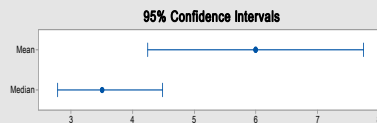
| Anderson-Darling Normality Test | |
|------------------------------------|---------------|
| A-Squared | 8.03 |
| P-Value | <0.005 |
| Mean | 3.4439 |
| StDev | 3.2548 |
| Variance | 10.5934 |
| Skewness | 2.33852 |
| Kurtosis | 5.52809 |
| N | 80 |
| Minimum | 0.5000 |
| 1st Quartile | 1.5550 |
| Median | 2.1750 |
| 3rd Quartile | 3.7975 |
| Maximum | 15.9800 |
| 95% Confidence Interval for Mean | |
| | 2.7196 4.1682 |
| 95% Confidence Interval for Median | |
| | 1.9300 2.7622 |
| 95% Confidence Interval for StDev | |
| | 2.8168 3.8552 |



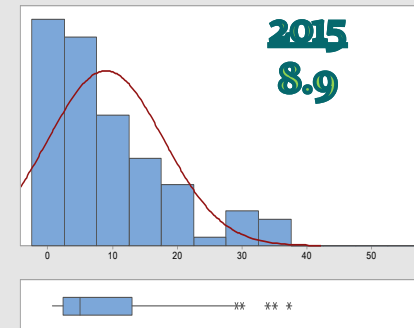
Summary Report for Sodium Year = 2014



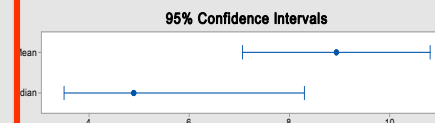
| Anderson-Darling Normality Test | |
|------------------------------------|---------------|
| A-Squared | 11.04 |
| P-Value | <0.005 |
| Mean | 5.9985 |
| StDev | 8.0755 |
| Variance | 65.2142 |
| Skewness | 4.1828 |
| Kurtosis | 21.4011 |
| N | 84 |
| Minimum | 0.9700 |
| 1st Quartile | 1.9200 |
| Median | 3.5000 |
| 3rd Quartile | 6.7700 |
| Maximum | 56.7500 |
| 95% Confidence Interval for Mean | |
| | 4.2440 7.7490 |
| 95% Confidence Interval for Median | |
| | 2.7745 4.4798 |
| 95% Confidence Interval for StDev | |
| | 7.0119 9.5225 |



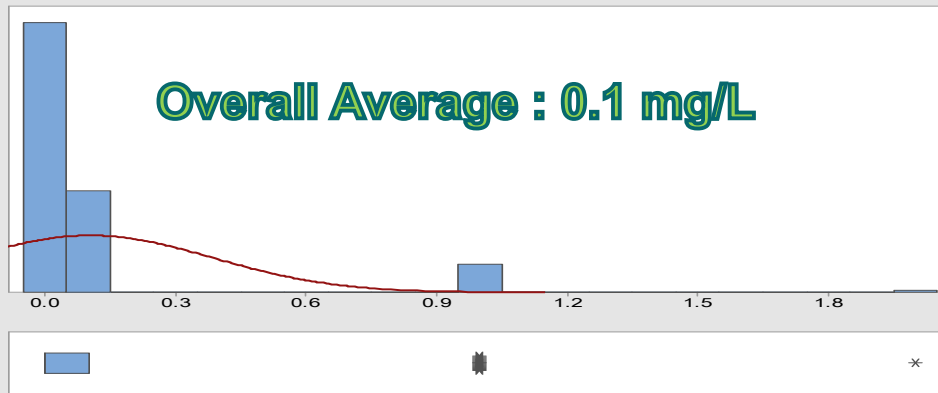
Summary Report for Sodium Year = 2015



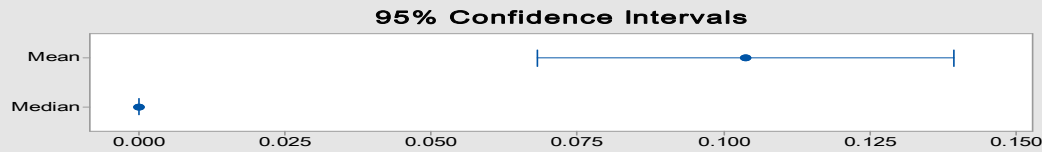
| Anderson-Darling Normality Test | |
|------------------------------------|----------------|
| A-Squared | 5.40 |
| P-Value | <0.005 |
| Mean | 8.9323 |
| StDev | 8.9428 |
| Variance | 79.9703 |
| Skewness | 1.42788 |
| Kurtosis | 1.42634 |
| N | 90 |
| Minimum | 0.6500 |
| 1st Quartile | 2.3200 |
| Median | 4.8900 |
| 3rd Quartile | 12.9800 |
| Maximum | 37.1800 |
| 95% Confidence Interval for Mean | |
| | 7.0593 10.8053 |
| 95% Confidence Interval for Median | |
| | 3.5022 8.3010 |
| 95% Confidence Interval for StDev | |
| | 7.7999 10.4808 |



KAHRAMAA K Content Overall Statistics (2013 to 2015)

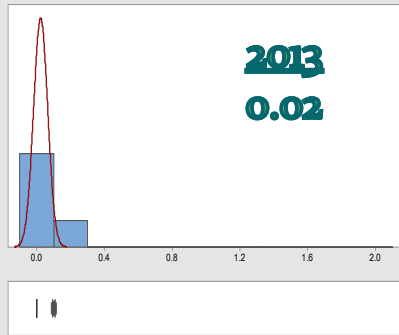


| Anderson-Darling Normality Test | |
|------------------------------------|-----------------|
| A-Squared | 61.69 |
| P-Value | <0.005 |
| Mean | 0.10372 |
| StDev | 0.28083 |
| Variance | 0.07887 |
| Skewness | 3.5660 |
| Kurtosis | 13.3219 |
| N | 242 |
| Minimum | 0.00000 |
| 1st Quartile | 0.00000 |
| Median | 0.00000 |
| 3rd Quartile | 0.10000 |
| Maximum | 2.00000 |
| 95% Confidence Interval for Mean | |
| | 0.06816 0.13928 |
| 95% Confidence Interval for Median | |
| | 0.00000 0.00000 |
| 95% Confidence Interval for StDev | |
| | 0.25784 0.30836 |

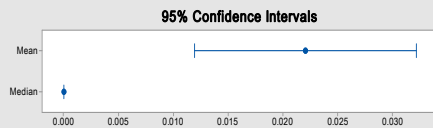


K (Potassium)
Statistics

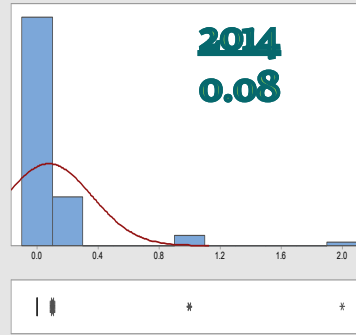
Summary Report for Potassium Year = 2013



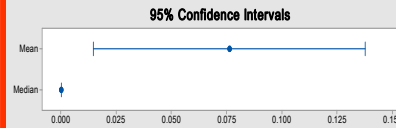
| Anderson-Darling Normality Test | |
|------------------------------------|-------------------|
| A-Squared | 17.20 |
| P-Value | <0.005 |
| Mean | 0.022059 |
| StDev | 0.041773 |
| Variance | 0.001745 |
| Skewness | 1.37831 |
| Kurtosis | -0.10420 |
| N | 68 |
| Minimum | 0.000000 |
| 1st Quartile | 0.000000 |
| Median | 0.000000 |
| 3rd Quartile | 0.000000 |
| Maximum | 0.100000 |
| 95% Confidence Interval for Mean | |
| | 0.011948 0.032170 |
| 95% Confidence Interval for Median | |
| | 0.000000 0.000000 |
| 95% Confidence Interval for StDev | |
| | 0.035741 0.050271 |



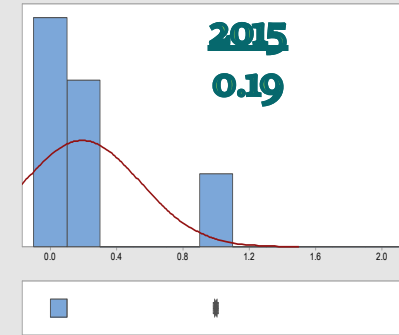
Summary Report for Potassium Year = 2014



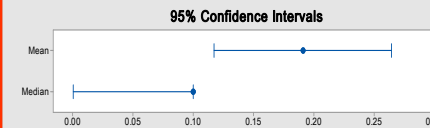
| Anderson-Darling Normality Test | |
|------------------------------------|-----------------|
| A-Squared | 24.18 |
| P-Value | <0.005 |
| Mean | 0.07619 |
| StDev | 0.28311 |
| Variance | 0.08015 |
| Skewness | 5.1435 |
| Kurtosis | 28.9149 |
| N | 84 |
| Minimum | 0.00000 |
| 1st Quartile | 0.00000 |
| Median | 0.00000 |
| 3rd Quartile | 0.00000 |
| Maximum | 2.00000 |
| 95% Confidence Interval for Mean | |
| | 0.01475 0.13763 |
| 95% Confidence Interval for Median | |
| | 0.00000 0.00000 |
| 95% Confidence Interval for StDev | |
| | 0.24582 0.33383 |



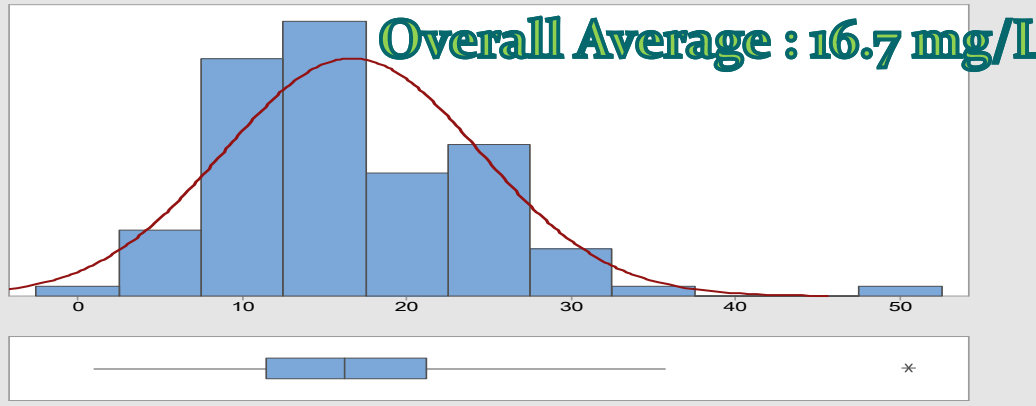
Summary Report for Potassium Year = 2015



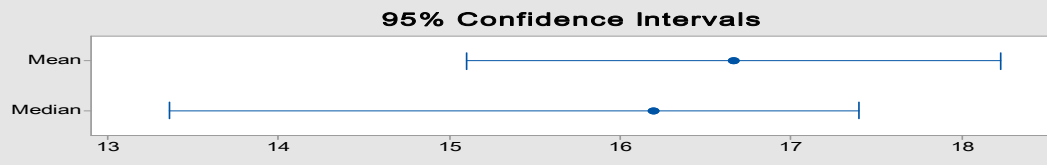
| Anderson-Darling Normality Test | |
|------------------------------------|-----------------|
| A-Squared | 19.76 |
| P-Value | <0.005 |
| Mean | 0.19111 |
| StDev | 0.35209 |
| Variance | 0.12397 |
| Skewness | 1.86358 |
| Kurtosis | 1.63168 |
| N | 90 |
| Minimum | 0.00000 |
| 1st Quartile | 0.00000 |
| Median | 0.10000 |
| 3rd Quartile | 0.10000 |
| Maximum | 1.00000 |
| 95% Confidence Interval for Mean | |
| | 0.11737 0.26485 |
| 95% Confidence Interval for Median | |
| | 0.00000 0.10000 |
| 95% Confidence Interval for StDev | |
| | 0.30709 0.41265 |



KAHRAMAA Copper Content Overall Statistics (2013 to 2015)

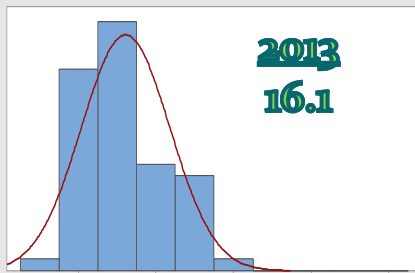


| Anderson-Darling Normality Test | |
|------------------------------------|---------------|
| A-Squared | 1.01 |
| P-Value | 0.011 |
| Mean | 16.666 |
| StDev | 7.794 |
| Variance | 60.751 |
| Skewness | 0.95803 |
| Kurtosis | 2.48139 |
| N | 98 |
| Minimum | 1.000 |
| 1st Quartile | 11.450 |
| Median | 16.200 |
| 3rd Quartile | 21.150 |
| Maximum | 50.500 |
| 95% Confidence Interval for Mean | |
| | 15.104 18.229 |
| 95% Confidence Interval for Median | |
| | 13.366 17.400 |
| 95% Confidence Interval for StDev | |
| | 6.835 9.069 |



Copper Statistics

Summary Report for Copper Year = 2013



| Anderson-Darling Normality Test | |
|---------------------------------|-----------|
| A-Squared | 0.78 |
| P-Value | 0.041 |
| Mean | 16.070 |
| StDev | 5.722 |
| Variance | 32.737 |
| Skewness | 0.438483 |
| Kurtosis | -0.492614 |
| N | 57 |

| | |
|--------------|--------|
| Minimum | 4.000 |
| 1st Quartile | 11.750 |
| Median | 15.600 |
| 3rd Quartile | 20.550 |
| Maximum | 28.300 |

95% Confidence Interval for Mean

| | | |
|--|--------|--------|
| | 14.552 | 17.588 |
|--|--------|--------|

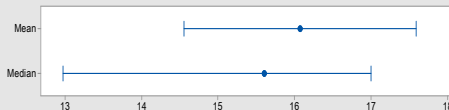
95% Confidence Interval for Median

| | | |
|--|--------|--------|
| | 12.967 | 17.000 |
|--|--------|--------|

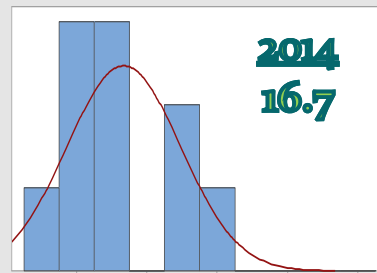
95% Confidence Interval for StDev

| | | |
|--|-------|-------|
| | 4.831 | 7.019 |
|--|-------|-------|

95% Confidence Intervals



Summary Report for Copper Year = 2014



| Anderson-Darling Normality Test | |
|---------------------------------|----------|
| A-Squared | 0.57 |
| P-Value | 0.102 |
| Mean | 16.690 |
| StDev | 8.084 |
| Variance | 65.352 |
| Skewness | 0.39175 |
| Kurtosis | -1.17513 |
| N | 10 |

| | |
|--------------|--------|
| Minimum | 4.900 |
| 1st Quartile | 11.375 |
| Median | 14.100 |
| 3rd Quartile | 27.325 |
| Maximum | 27.500 |

95% Confidence Interval for Mean

| | | |
|--|--------|--------|
| | 10.907 | 22.473 |
|--|--------|--------|

95% Confidence Interval for Median

| | | |
|--|--------|--------|
| | 11.218 | 27.334 |
|--|--------|--------|

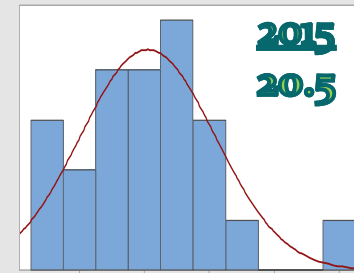
95% Confidence Interval for StDev

| | | |
|--|-------|--------|
| | 5.561 | 14.758 |
|--|-------|--------|

95% Confidence Intervals



Summary Report for Copper Year = 2015



| Anderson-Darling Normality Test | |
|---------------------------------|---------|
| A-Squared | 0.45 |
| P-Value | 0.251 |
| Mean | 20.517 |
| StDev | 10.400 |
| Variance | 108.160 |
| Skewness | 0.82196 |
| Kurtosis | 2.02716 |
| N | 23 |

| | |
|--------------|--------|
| Minimum | 3.900 |
| 1st Quartile | 15.500 |
| Median | 19.200 |
| 3rd Quartile | 27.400 |
| Maximum | 50.500 |

95% Confidence Interval for Mean

| | | |
|--|--------|--------|
| | 16.020 | 25.015 |
|--|--------|--------|

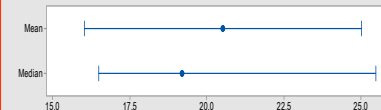
95% Confidence Interval for Median

| | | |
|--|--------|--------|
| | 16.490 | 25.476 |
|--|--------|--------|

95% Confidence Interval for StDev

| | | |
|--|-------|--------|
| | 8.043 | 14.720 |
|--|-------|--------|

95% Confidence Intervals



Other Parameters Statistics

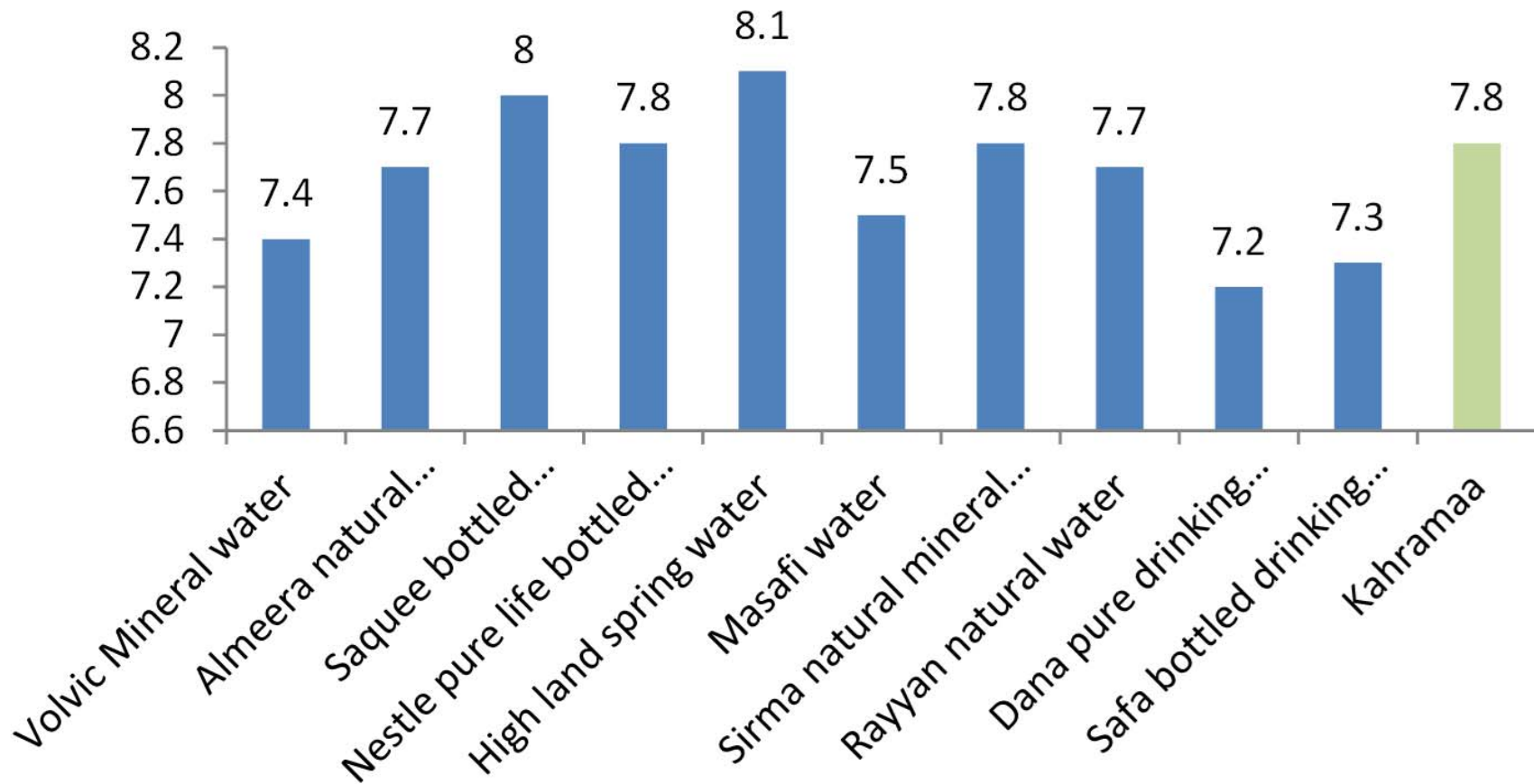
| Parameter | 2013 | 2014 | 2015 |
|-----------------------------------|-------|------|------|
| Fluoride (mg/l) | N.D.* | N.D | N.D |
| Selenium ($\mu\text{g/l}$) | N.D | N.D | N.D |
| Chromium ($\mu\text{g/l}$) | N.D | N.D | N.D |
| Ethyl benzene ($\mu\text{g/l}$) | N.D | N.D | N.D |
| Mono chlorobenzene | N.D | N.D | N.D |
| 1,4-dichlorobenzene | N.D | N.D | N.D |
| Toluene ($\mu\text{g/l}$) | N.D | N.D | N.D |
| Xylenes ($\mu\text{g/l}$) | N.D | N.D | N.D |

N.D.*: Not Detected

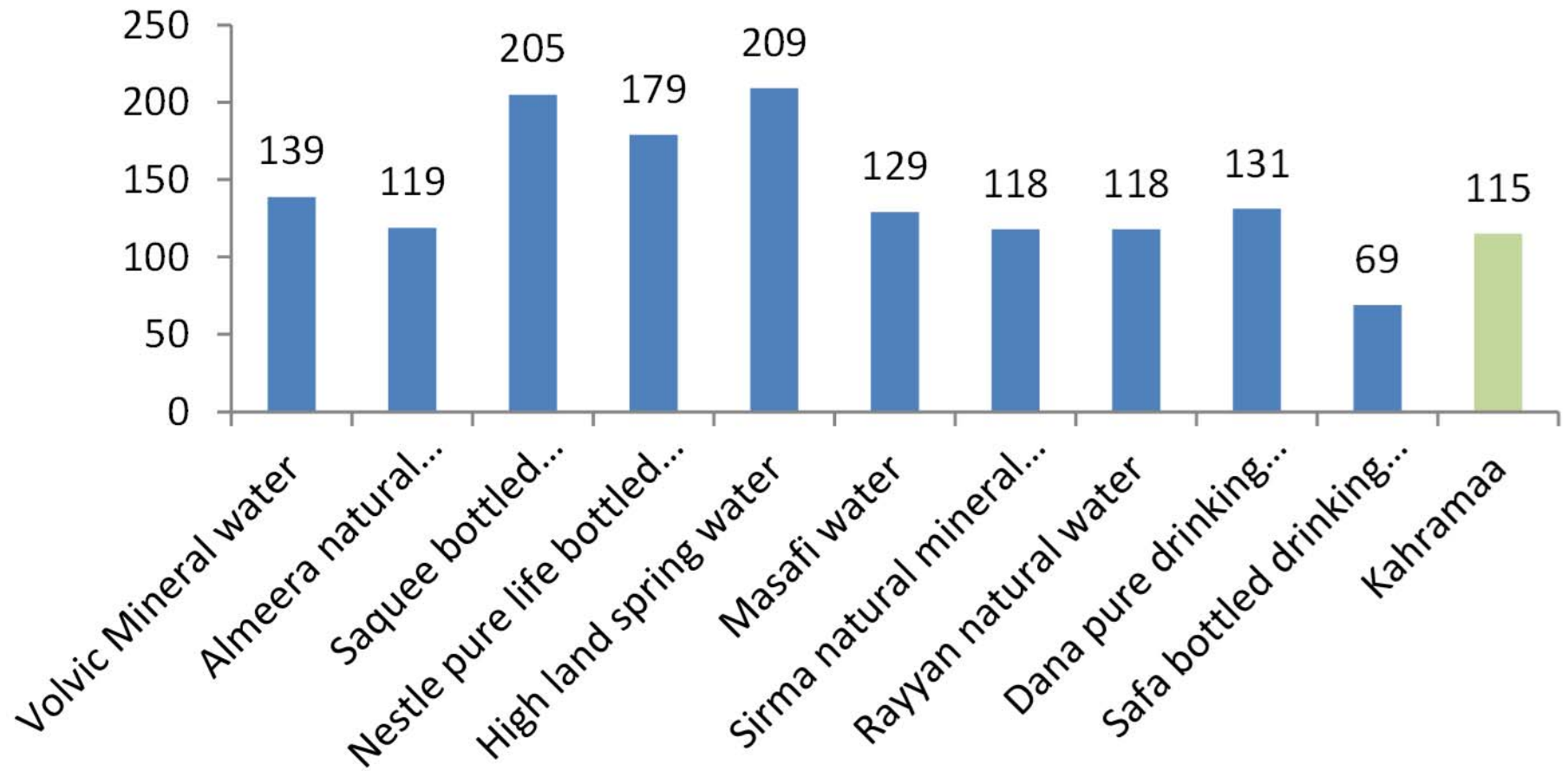
عناصر مياه الشرب بالمياه المعبأة

Bottled Water Quality
Analyzed Parameters

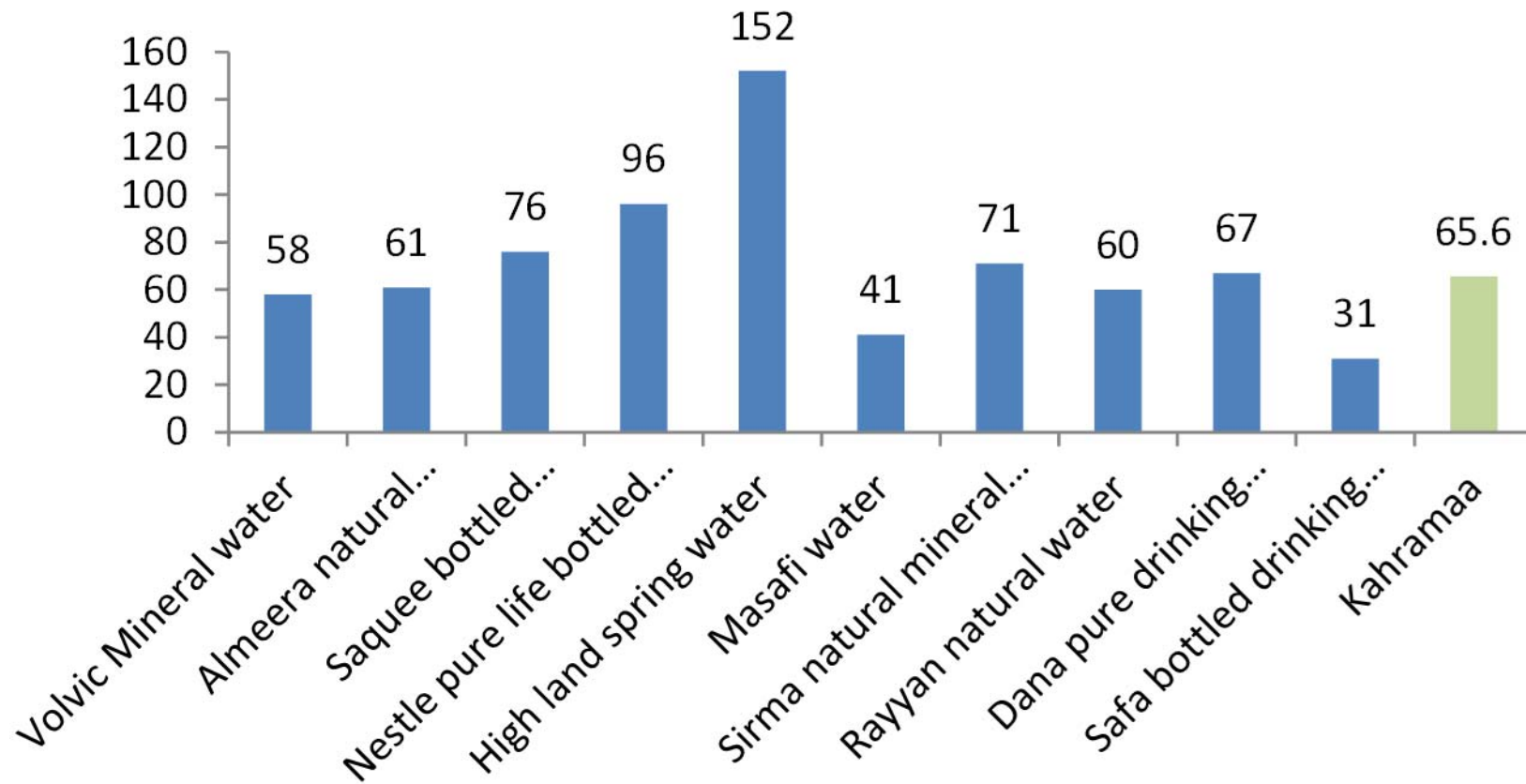
pH



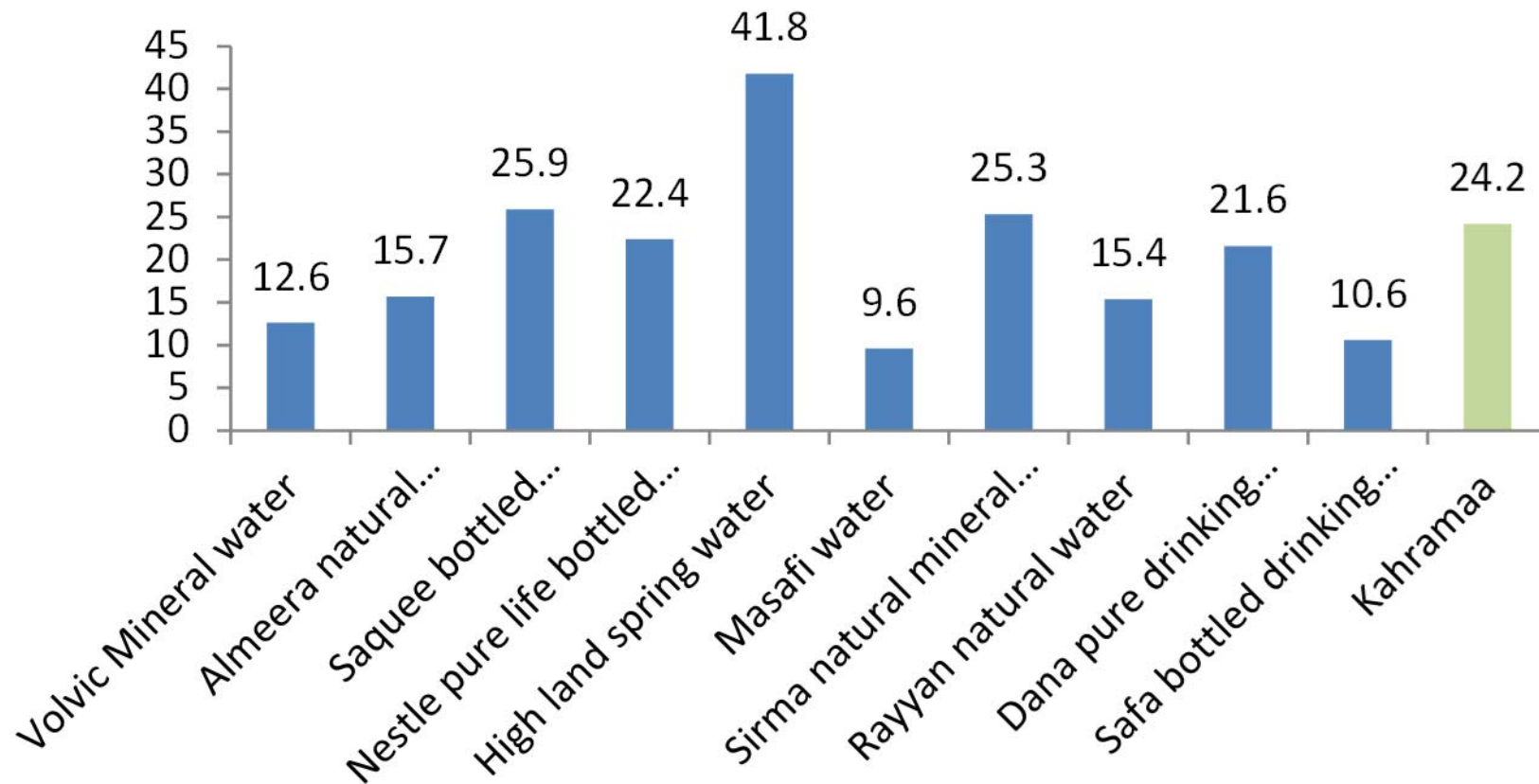
TDS



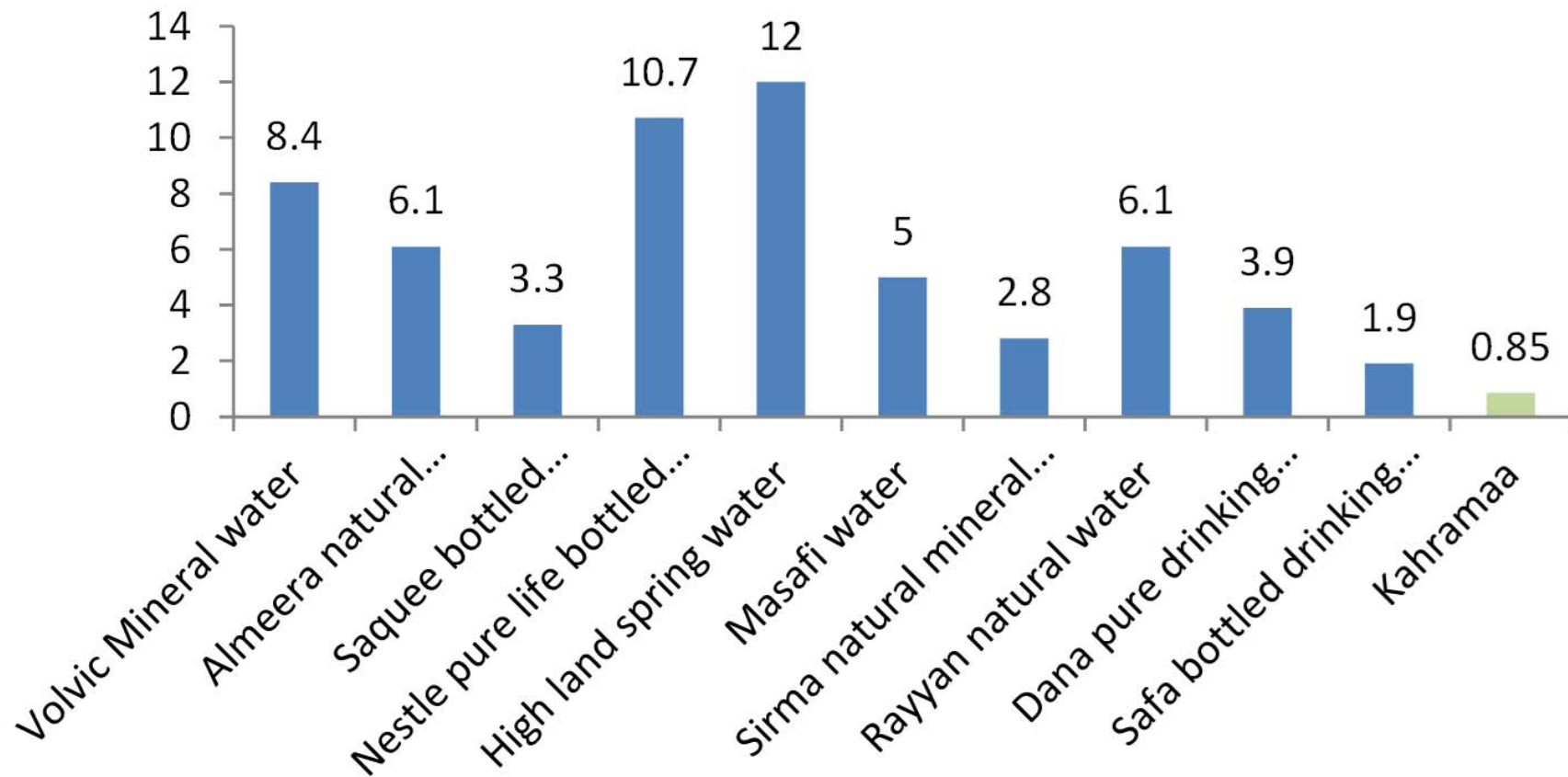
Total hardness (as Ca)



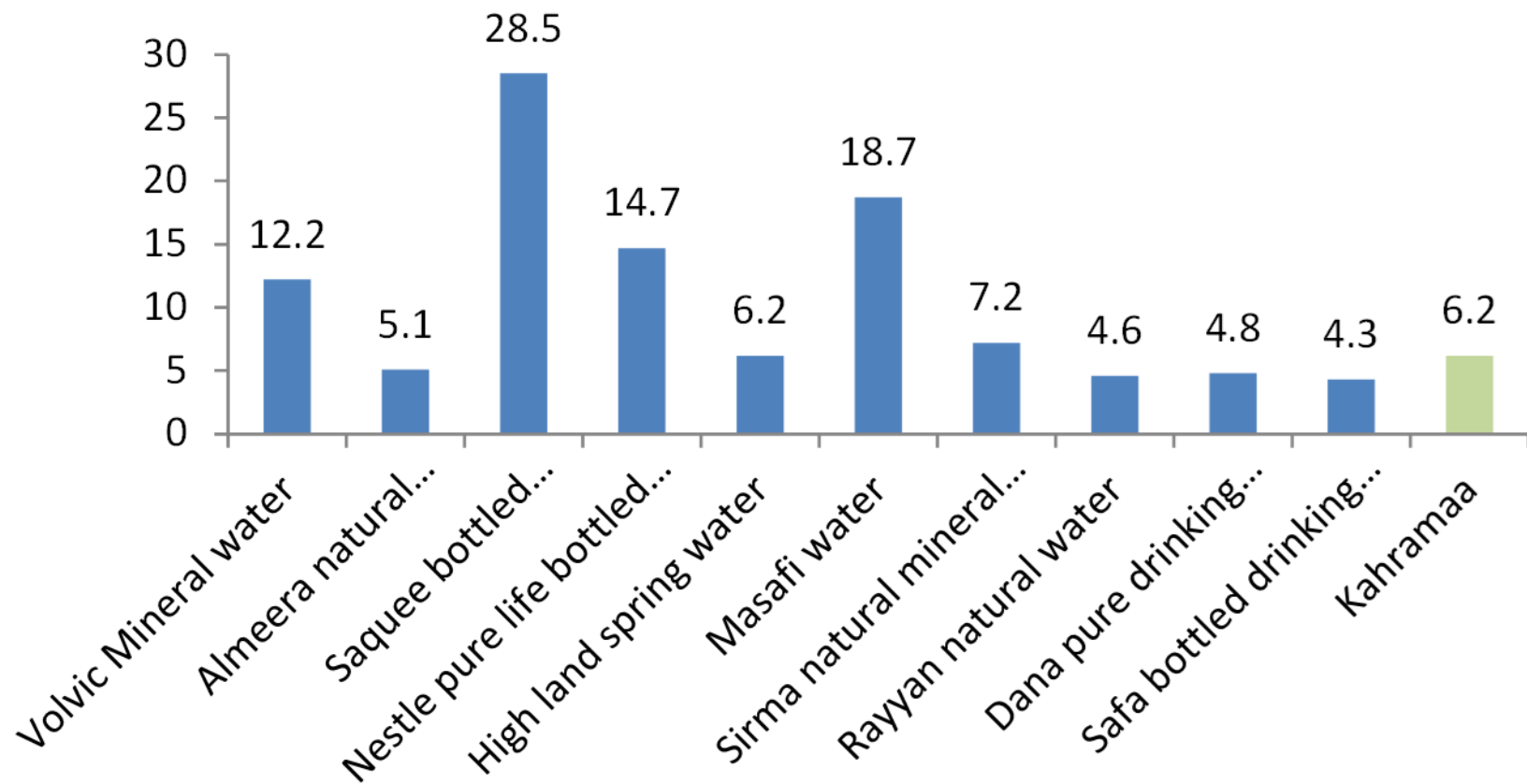
Calcium (as Ca)



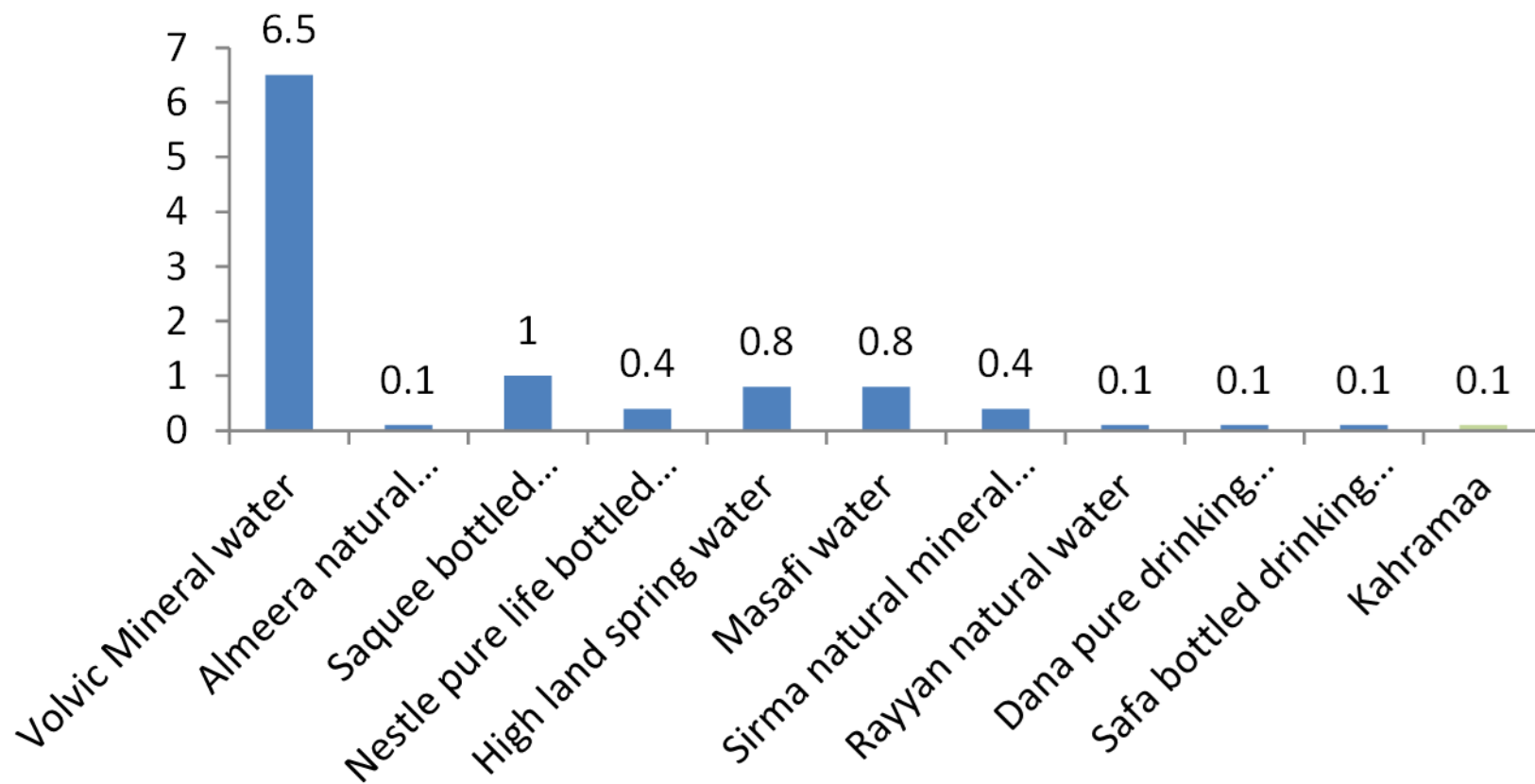
Magnesium



Sodium



Potassium



Other Parameters Statistics

| Parameter | BW ₁ | BW ₂ | BW ₃ | BW ₄ | BW ₅ | BW ₆ | BW ₇ | BW ₈ | BW ₉ | BW ₁₀ |
|----------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|
| Fluoride (mg/l) | 0.2 | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Selenium (µg/l) | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Chromium (µg/l) | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Ethyl benzene (µg/l) | ND | ND | ND | 3.4 | ND | ND | ND | ND | ND | ND |
| Mono chlorobenzene | ND | ND | 0.73 | 1.7 | ND | 0.58 | ND | ND | ND | ND |
| 1,4-dichlorobenzene | ND | 0.57 | 0.61 | 1.5 | 0.75 | 1.6 | ND | ND | ND | ND |
| Toluene (µg/l) | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Xylenes (µg/l) | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |

BW1: Volvic mineral water; **BW2:** Almeera natural mineral water; **BW3:** Saqee bottled drinking water; **BW4:** Nestle pure life bottled drinking water; **BW5:** High land spring water; **BW6:** Masafi water; **BW7:** Sirma natural mineral water; **BW8:** Rayyan natural water; **BW9:** Dana pure drinking water; **BW10:** Safa bottled drinking water



التوصيات و الاستنتاجات

Conclusions &
Recommendation

Conclusions

1. Qatar's Drinking Water quality is protected; conditions very close to natural or pristine levels.
2. Taste causing elements are within their taste threshold limit in KAHRAMAA water.

الاستنتاجات

1. مياه الشرب بدولة قطر عالية الجودة وظروفها قريبة جدا من المستويات الطبيعية أو البكر .
2. مستويات العناصر المسببة للطعم بمياه كهرباء ضمن الحدود العتبية التي أقرت محليا وعالميا (بل أقل منها بكثير).

Conclusions

Numerous of factors influence such quality such as:

- Proper and Effective management system,
- New infrastructure,
- Proper selection of the used chemical for mineralization, and
- Proper selection of remineralization dosage.

الاستنتاجات

هناك العديد من العوامل التي ادت الى الوصول لمثل هذه النوعيه الممتازة مثل:

- نظام إدارة الجودة المناسب والفعال،
- البنية التحتية الجديدة وتغيير شبكة التوزيع،
- حسن اختيار نقاوة المواد الكيميائية المستخدمة في التمعدن،
- حسن اختيار الجرعات التي يتم حقنها من مواد التمعدن الكيميائية.

Conclusions

2. While Comparing KM water Vs. Bottled ones, the following facts were identified:

- KAHRAMAA water contains a significant concentration of Calcium and a considerable level of Sodium, Magnesium, Potassium and Chloride in comparison to the tested bottled drinking water.

الاستنتاجات

2. بمقارنة مياه كهراء بالعديد من منتجات شركات تعبئة المياه، تبين لنا الحقائق التالية:

- تحتوي ماء كهراء على تركيز كبير من الكالسيوم ومستوى كبير من الصوديوم والمغنيسيوم والبوتاسيوم والكلوريد بالمقارنة مع مياه الشرب المعبأة في زجاجات

Conclusions

- KAHRAMAA water is also enriched with few trace element like Copper, Manganese and Zinc that are necessary for various physiological functions.
- **Other non-health based constituents** like pH, TDS and hardness were found to be almost the same both in KAHRAMAA water as well as majority of the bottled drinking water.

الاستنتاجات

- مياه كهرباء غنية بالمعادن (مثل النحاس، المنجنيز والزنك) اللازمة لجميع الوظائف الفسيولوجية بالجسم.
- **المكونات الغير صحية** (مثل الأسم الهيدروجيني، الأملاح المذابة الكلية والصلبة) وجدت في نفس المعدلات تقريبا في مياه كهرباء ومعظم شركات المياه المعبأة.

Conclusions

- Mineral contents of some of the bottled water brands has a marginal difference with the values printed on their labels.

الاستنتاجات

- المحتويات المعدنية لبعض الزجاجات الخاصة بالمياه المعبأة لها فرق هامشي وواضح في بعض الحالات عن القيم المطبوعة على بطاقتها.

Recommendation

- KAHRAMAA urge Local customers to use KM water in stead of the bottled water as KAHRAMAA water if not better in all respects but has an equally excellent quality that meets the taste and health standards worldwide.

التوصيات

- كهرماء تدعو جميع مواطني دولة قطر والمقيمين على أرضها وزائريها على حد سواء الى استخدام مياه كهرماء في جميع الأغراض والتي اثبت أنها ليست فقط أفضل من الكثير مياه الشرب المعبأه بل ومتوافقه مع المتطلبات العالميه في هذا الشأن.

Recommendation

- KAHRAMAA urge all GCC countries to simulate the very same study Vs. bottled water available within the local markets. Such studies will enhance customer satisfaction and would be used for continual improvement opportunities

التوصيات

- كهرماء تدعو جميع دول مجلس التعاون الخليجي أن تكرر نفس الدراسة بكل دوله على حده والتي ستسهل عملية المقارنات الفعالة بين هذه الدول كما ستزيد فرص تطوير الأداء.



Thank you