FLC expression statistics

```
library(dplyr)
```

```
df = read.table('FLCexpression4stats.txt',header = TRUE)
```

Produce summary statistics

```
library(FSA)
```

```
Summarize(Ratio ~ Accession,
          data=df,
          digits=3)
```

```
##    Accession n  mean    sd   min    Q1 median    Q3   max
## 1     Ait-14 3 3.950 0.636 3.230 3.709  4.188 4.311 4.434
## 2      Ait-9 3 2.160 0.216 1.943 2.053  2.163 2.269 2.375
## 3      Arb-0 3 0.866 0.169 0.675 0.800  0.925 0.961 0.997
## 4      Col-0 3 0.023 0.006 0.018 0.020  0.022 0.026 0.030
## 5      Cvi-0 3 0.742 0.101 0.671 0.685  0.698 0.778 0.857
## 6     Elh-46 3 0.944 0.107 0.822 0.908  0.994 1.005 1.017
## 7    F10-1-3 3 0.218 0.025 0.190 0.207  0.224 0.232 0.239
## 8      F13-8 3 0.203 0.009 0.194 0.200  0.206 0.208 0.211
## 9       F3-2 3 0.219 0.018 0.199 0.211  0.224 0.229 0.234
## 10      F9-2 3 0.213 0.014 0.202 0.204  0.207 0.218 0.229
## 11  FRI+FLC- 3 0.055 0.009 0.046 0.052  0.057 0.060 0.063
## 12  FRI+FLC+ 3 0.915 0.080 0.868 0.869  0.869 0.938 1.007
## 13      S1-1 3 0.754 0.043 0.722 0.729  0.737 0.770 0.802
## 14     S15-3 3 0.727 0.140 0.587 0.658  0.729 0.798 0.866
## 15     S5-10 3 1.488 0.221 1.277 1.373  1.469 1.593 1.717
## 16     Set-0 3 0.671 0.032 0.634 0.661  0.689 0.689 0.689
## 17     Set-6 3 1.440 0.282 1.115 1.352  1.588 1.603 1.617
```

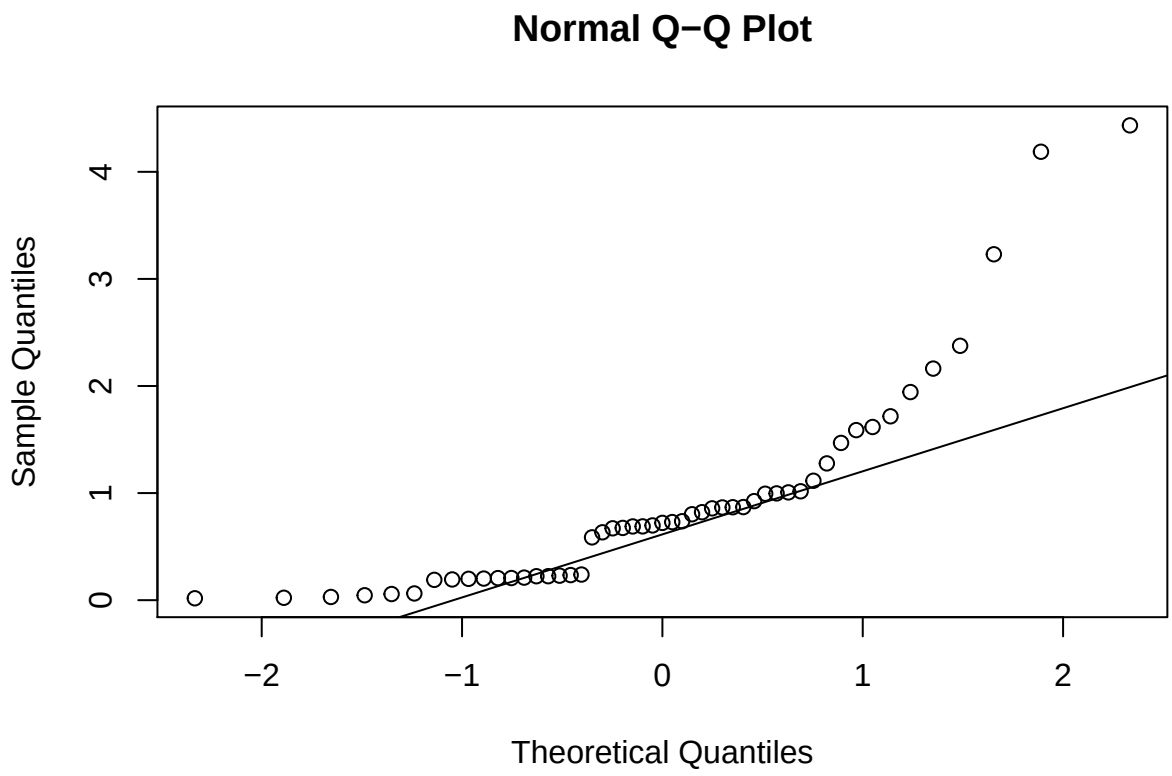
Test homoscedasticity

```
bartlett.test(Ratio ~ Accession,df)
```

```
##
##  Bartlett test of homogeneity of variances
##
## data:  Ratio by Accession
## Bartlett's K-squared = 71.565, df = 16, p-value = 5.3e-09
```

Test normality

```
qqnorm(df$Ratio)
qqline(df$Ratio)
```




```
shapiro.test(df$Ratio)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  df$Ratio
## W = 0.76978, p-value = 1.534e-07
```

Kruskal-Wallis

```
library(agricolae)
```

```
kru = kruskal(df$Ratio, df$Accession, alpha=0.05, p.adj=c("bonferroni"), group=FALSE)
kru
```

```
## $statistics
```

```
##      Chisq Df      p.chisq  t.value      MSD
##   47.77074 16 5.160215e-05 3.955653 12.29447
##
## $parameters
##             test  p.ajusted       name.t ntr alpha
##   Kruskal-Wallis bonferroni df$Accession  17  0.05
##
## $means
##            df.Ratio     rank         std r        Min        Max        Q25
## Ait-14   3.95047290 50.00000 0.635905476 3 3.23007005 4.43372139 3.70884865
## Ait-9    2.16044158 47.00000 0.215967104 3 1.94340852 2.37532671 2.05299902
## Arb-0    0.86557882 31.33333 0.169169204 3 0.67473289 0.99707938 0.79982854
## Col-0    0.02343123  2.00000 0.006132875 3 0.01783395 0.02998687 0.02015342
## Cvi-0    0.74222076 25.66667 0.100593879 3 0.67115561 0.85732366 0.68466931
## Elh-46   0.94418855 35.00000 0.106757238 3 0.82161912 1.01686001 0.90785282
## F10-1-3  0.21769729 13.33333 0.025411560 3 0.18972397 0.23935647 0.20686770
## F13-8    0.20345644 10.66667 0.008912416 3 0.19354061 0.21079939 0.19978497
## F3-2     0.21904123 13.33333 0.018022718 3 0.19918331 0.23436145 0.21138112
## F9-2     0.21258758 12.66667 0.014430021 3 0.20189609 0.22900105 0.20438084
## FRI+FLC- 0.05532642  5.00000 0.008594284 3 0.04588852 0.06270173 0.05163877
## FRI+FLC+ 0.91460034 35.00000 0.079675515 3 0.86778546 1.00659686 0.86860207
## S1-1     0.75378822 27.66667 0.042816178 3 0.72176922 0.80242153 0.72947157
## S15-3    0.72724700 26.00000 0.139671822 3 0.58662538 0.86594925 0.65789588
## S5-10    1.48764719 42.66667 0.220606645 3 1.27717677 1.71715606 1.37289275
## Set-0    0.67054448 22.33333 0.031720320 3 0.63391776 0.68906172 0.66128586
## Set-6    1.44011075 42.33333 0.281750905 3 1.11520608 1.61709895 1.35161664
##                Q50        Q75
## Ait-14   4.18762724 4.31067432
## Ait-9    2.16258952 2.26895811
## Arb-0    0.92492419 0.96100179
## Col-0    0.02247289 0.02622988
## Cvi-0    0.69818300 0.77775333
## Elh-46   0.99408653 1.00547327
## F10-1-3  0.22401143 0.23168395
## F13-8    0.20602932 0.20841436
## F3-2     0.22357894 0.22897019
## F9-2     0.20686559 0.21793332
## FRI+FLC- 0.05738902 0.06004537
## FRI+FLC+ 0.86941868 0.93800777
## S1-1     0.73717392 0.76979772
## S15-3    0.72916638 0.79755781
## S5-10    1.46860873 1.59288240
## Set-0    0.68865395 0.68885783
## Set-6    1.58802720 1.60256308
##
## $comparison
##                       Difference pvalue Signif.          LCL         UCL
## Ait-14 - Ait-9         3.0000000 1.0000          -9.29446657  15.2944666
## Ait-14 - Arb-0        18.6666667 0.0001     ***   6.37220009  30.9611332
## Ait-14 - Col-0        48.0000000 0.0000     ***  35.70553343  60.2944666
## Ait-14 - Cvi-0        24.3333333 0.0000     ***  12.03886676  36.6277999
## Ait-14 - Elh-46       15.0000000 0.0039      **   2.70553343  27.2944666
## Ait-14 - F10-1-3      36.6666667 0.0000     ***  24.37220009  48.9611332
## Ait-14 - F13-8        39.3333333 0.0000     ***  27.03886676  51.6277999
```

```
## Ait-14 - F3-2        36.6666667 0.0000     ***  24.37220009  48.9611332
## Ait-14 - F9-2        37.3333333 0.0000     ***  25.03886676  49.6277999
## Ait-14 - FRI+FLC-    45.0000000 0.0000     ***  32.70553343  57.2944666
## Ait-14 - FRI+FLC+    15.0000000 0.0039      **   2.70553343  27.2944666
## Ait-14 - S1-1        22.3333333 0.0000     ***  10.03886676  34.6277999
## Ait-14 - S15-3       24.0000000 0.0000     ***  11.70553343  36.2944666
## Ait-14 - S5-10        7.3333333 1.0000          -4.96113324  19.6277999
## Ait-14 - Set-0       27.6666667 0.0000     ***  15.37220009  39.9611332
## Ait-14 - Set-6        7.6666667 1.0000          -4.62779991  19.9611332
## Ait-9 - Arb-0        15.6666667 0.0021      **   3.37220009  27.9611332
## Ait-9 - Col-0        45.0000000 0.0000     ***  32.70553343  57.2944666
## Ait-9 - Cvi-0        21.3333333 0.0000     ***   9.03886676  33.6277999
## Ait-9 - Elh-46       12.0000000 0.0655       .  -0.29446657  24.2944666
## Ait-9 - F10-1-3      33.6666667 0.0000     ***  21.37220009  45.9611332
## Ait-9 - F13-8        36.3333333 0.0000     ***  24.03886676  48.6277999
## Ait-9 - F3-2         33.6666667 0.0000     ***  21.37220009  45.9611332
## Ait-9 - F9-2         34.3333333 0.0000     ***  22.03886676  46.6277999
## Ait-9 - FRI+FLC-     42.0000000 0.0000     ***  29.70553343  54.2944666
## Ait-9 - FRI+FLC+     12.0000000 0.0655       .  -0.29446657  24.2944666
## Ait-9 - S1-1         19.3333333 0.0001     ***   7.03886676  31.6277999
## Ait-9 - S15-3        21.0000000 0.0000     ***   8.70553343  33.2944666
## Ait-9 - S5-10         4.3333333 1.0000          -7.96113324  16.6277999
## Ait-9 - Set-0        24.6666667 0.0000     ***  12.37220009  36.9611332
## Ait-9 - Set-6         4.6666667 1.0000          -7.62779991  16.9611332
## Arb-0 - Col-0        29.3333333 0.0000     ***  17.03886676  41.6277999
## Arb-0 - Cvi-0         5.6666667 1.0000          -6.62779991  17.9611332
## Arb-0 - Elh-46       -3.6666667 1.0000         -15.96113324   8.6277999
## Arb-0 - F10-1-3      18.0000000 0.0002     ***   5.70553343  30.2944666
## Arb-0 - F13-8        20.6666667 0.0000     ***   8.37220009  32.9611332
## Arb-0 - F3-2         18.0000000 0.0002     ***   5.70553343  30.2944666
## Arb-0 - F9-2         18.6666667 0.0001     ***   6.37220009  30.9611332
## Arb-0 - FRI+FLC-     26.3333333 0.0000     ***  14.03886676  38.6277999
## Arb-0 - FRI+FLC+     -3.6666667 1.0000         -15.96113324   8.6277999
## Arb-0 - S1-1          3.6666667 1.0000          -8.62779991  15.9611332
## Arb-0 - S15-3         5.3333333 1.0000          -6.96113324  17.6277999
## Arb-0 - S5-10       -11.3333333 0.1198         -23.62779991   0.9611332
## Arb-0 - Set-0         9.0000000 0.8933          -3.29446657  21.2944666
## Arb-0 - Set-6       -11.0000000 0.1613         -23.29446657   1.2944666
## Col-0 - Cvi-0       -23.6666667 0.0000     *** -35.96113324 -11.3722001
## Col-0 - Elh-46      -33.0000000 0.0000     *** -45.29446657 -20.7055334
## Col-0 - F10-1-3     -11.3333333 0.1198         -23.62779991   0.9611332
## Col-0 - F13-8        -8.6666667 1.0000         -20.96113324   3.6277999
## Col-0 - F3-2        -11.3333333 0.1198         -23.62779991   0.9611332
## Col-0 - F9-2        -10.6666667 0.2165         -22.96113324   1.6277999
## Col-0 - FRI+FLC-     -3.0000000 1.0000         -15.29446657   9.2944666
## Col-0 - FRI+FLC+    -33.0000000 0.0000     *** -45.29446657 -20.7055334
## Col-0 - S1-1        -25.6666667 0.0000     *** -37.96113324 -13.3722001
## Col-0 - S15-3       -24.0000000 0.0000     *** -36.29446657 -11.7055334
## Col-0 - S5-10       -40.6666667 0.0000     *** -52.96113324 -28.3722001
## Col-0 - Set-0       -20.3333333 0.0000     *** -32.62779991  -8.0388668
## Col-0 - Set-6       -40.3333333 0.0000     *** -52.62779991 -28.0388668
## Cvi-0 - Elh-46       -9.3333333 0.6783         -21.62779991   2.9611332
## Cvi-0 - F10-1-3      12.3333333 0.0482       *   0.03886676  24.6277999
## Cvi-0 - F13-8        15.0000000 0.0039      **   2.70553343  27.2944666
```

```
## Cvi-0 - F3-2         12.3333333 0.0482      *   0.03886676  24.6277999
## Cvi-0 - F9-2         13.0000000 0.0260      *   0.70553343  25.2944666
## Cvi-0 - FRI+FLC-     20.6666667 0.0000    ***   8.37220009  32.9611332
## Cvi-0 - FRI+FLC+     -9.3333333 0.6783        -21.62779991   2.9611332
## Cvi-0 - S1-1         -2.0000000 1.0000        -14.29446657  10.2944666
## Cvi-0 - S15-3        -0.3333333 1.0000        -12.62779991  11.9611332
## Cvi-0 - S5-10       -17.0000000 0.0006    *** -29.29446657  -4.7055334
## Cvi-0 - Set-0         3.3333333 1.0000         -8.96113324  15.6277999
## Cvi-0 - Set-6       -16.6666667 0.0008    *** -28.96113324  -4.3722001
## Elh-46 - F10-1-3     21.6666667 0.0000    ***   9.37220009  33.9611332
## Elh-46 - F13-8       24.3333333 0.0000    ***  12.03886676  36.6277999
## Elh-46 - F3-2        21.6666667 0.0000    ***   9.37220009  33.9611332
## Elh-46 - F9-2        22.3333333 0.0000    ***  10.03886676  34.6277999
## Elh-46 - FRI+FLC-    30.0000000 0.0000    ***  17.70553343  42.2944666
## Elh-46 - FRI+FLC+     0.0000000 1.0000        -12.29446657  12.2944666
## Elh-46 - S1-1         7.3333333 1.0000         -4.96113324  19.6277999
## Elh-46 - S15-3        9.0000000 0.8933         -3.29446657  21.2944666
## Elh-46 - S5-10       -7.6666667 1.0000        -19.96113324   4.6277999
## Elh-46 - Set-0       12.6666667 0.0355      *   0.37220009  24.9611332
## Elh-46 - Set-6       -7.3333333 1.0000        -19.62779991   4.9611332
## F10-1-3 - F13-8       2.6666667 1.0000         -9.62779991  14.9611332
## F10-1-3 - F3-2        0.0000000 1.0000        -12.29446657  12.2944666
## F10-1-3 - F9-2        0.6666667 1.0000        -11.62779991  12.9611332
## F10-1-3 - FRI+FLC-    8.3333333 1.0000         -3.96113324  20.6277999
## F10-1-3 - FRI+FLC+  -21.6666667 0.0000    *** -33.96113324  -9.3722001
## F10-1-3 - S1-1      -14.3333333 0.0074     ** -26.62779991  -2.0388668
## F10-1-3 - S15-3     -12.6666667 0.0355      * -24.96113324  -0.3722001
## F10-1-3 - S5-10     -29.3333333 0.0000    *** -41.62779991 -17.0388668
## F10-1-3 - Set-0      -9.0000000 0.8933        -21.29446657   3.2944666
## F10-1-3 - Set-6     -29.0000000 0.0000    *** -41.29446657 -16.7055334
## F13-8 - F3-2         -2.6666667 1.0000        -14.96113324   9.6277999
## F13-8 - F9-2         -2.0000000 1.0000        -14.29446657  10.2944666
## F13-8 - FRI+FLC-      5.6666667 1.0000         -6.62779991  17.9611332
## F13-8 - FRI+FLC+    -24.3333333 0.0000    *** -36.62779991 -12.0388668
## F13-8 - S1-1        -17.0000000 0.0006    *** -29.29446657  -4.7055334
## F13-8 - S15-3       -15.3333333 0.0028     ** -27.62779991  -3.0388668
## F13-8 - S5-10       -32.0000000 0.0000    *** -44.29446657 -19.7055334
## F13-8 - Set-0       -11.6666667 0.0887      . -23.96113324   0.6277999
## F13-8 - Set-6       -31.6666667 0.0000    *** -43.96113324 -19.3722001
## F3-2 - F9-2           0.6666667 1.0000        -11.62779991  12.9611332
## F3-2 - FRI+FLC-       8.3333333 1.0000         -3.96113324  20.6277999
## F3-2 - FRI+FLC+     -21.6666667 0.0000    *** -33.96113324  -9.3722001
## F3-2 - S1-1         -14.3333333 0.0074     ** -26.62779991  -2.0388668
## F3-2 - S15-3        -12.6666667 0.0355      * -24.96113324  -0.3722001
## F3-2 - S5-10        -29.3333333 0.0000    *** -41.62779991 -17.0388668
## F3-2 - Set-0         -9.0000000 0.8933        -21.29446657   3.2944666
## F3-2 - Set-6        -29.0000000 0.0000    *** -41.29446657 -16.7055334
## F9-2 - FRI+FLC-       7.6666667 1.0000         -4.62779991  19.9611332
## F9-2 - FRI+FLC+     -22.3333333 0.0000    *** -34.62779991 -10.0388668
## F9-2 - S1-1         -15.0000000 0.0039     ** -27.29446657  -2.7055334
## F9-2 - S15-3        -13.3333333 0.0190      * -25.62779991  -1.0388668
## F9-2 - S5-10        -30.0000000 0.0000    *** -42.29446657 -17.7055334
## F9-2 - Set-0         -9.6666667 0.5128        -21.96113324   2.6277999
## F9-2 - Set-6        -29.6666667 0.0000    *** -41.96113324 -17.3722001
```

```
## FRI+FLC- - FRI+FLC+ -30.0000000 0.0000     *** -42.29446657 -17.7055334
## FRI+FLC- - S1-1     -22.6666667 0.0000     *** -34.96113324 -10.3722001
## FRI+FLC- - S15-3    -21.0000000 0.0000     *** -33.29446657  -8.7055334
## FRI+FLC- - S5-10    -37.6666667 0.0000     *** -49.96113324 -25.3722001
## FRI+FLC- - Set-0    -17.3333333 0.0004     *** -29.62779991  -5.0388668
## FRI+FLC- - Set-6    -37.3333333 0.0000     *** -49.62779991 -25.0388668
## FRI+FLC+ - S1-1       7.3333333 1.0000          -4.96113324  19.6277999
## FRI+FLC+ - S15-3      9.0000000 0.8933          -3.29446657  21.2944666
## FRI+FLC+ - S5-10     -7.6666667 1.0000         -19.96113324   4.6277999
## FRI+FLC+ - Set-0     12.6666667 0.0355       *   0.37220009  24.9611332
## FRI+FLC+ - Set-6     -7.3333333 1.0000         -19.62779991   4.9611332
## S1-1 - S15-3          1.6666667 1.0000         -10.62779991  13.9611332
## S1-1 - S5-10        -15.0000000 0.0039      ** -27.29446657  -2.7055334
## S1-1 - Set-0          5.3333333 1.0000          -6.96113324  17.6277999
## S1-1 - Set-6        -14.6666667 0.0054      ** -26.96113324  -2.3722001
## S15-3 - S5-10       -16.6666667 0.0008     *** -28.96113324  -4.3722001
## S15-3 - Set-0         3.6666667 1.0000          -8.62779991  15.9611332
## S15-3 - Set-6       -16.3333333 0.0011      ** -28.62779991  -4.0388668
## S5-10 - Set-0        20.3333333 0.0000     ***   8.03886676  32.6277999
## S5-10 - Set-6         0.3333333 1.0000         -11.96113324  12.6277999
## Set-0 - Set-6       -20.0000000 0.0000     *** -32.29446657  -7.7055334
##
## $groups
## NULL
##
## attr(,"class")
## [1] "group"
```

```
kru = kruskal(df$Ratio, df$Accession, alpha=0.05, p.adj=c("bonferroni"), group=TRUE)
kru
```

```
## $statistics
##      Chisq Df      p.chisq  t.value      MSD
##   47.77074 16 5.160215e-05 3.955653 12.29447
##
## $parameters
##             test  p.ajusted       name.t ntr alpha
##   Kruskal-Wallis bonferroni df$Accession  17  0.05
##
## $means
##           df.Ratio     rank         std r        Min        Max        Q25
## Ait-14   3.95047290 50.00000 0.635905476 3 3.23007005 4.43372139 3.70884865
## Ait-9    2.16044158 47.00000 0.215967104 3 1.94340852 2.37532671 2.05299902
## Arb-0    0.86557882 31.33333 0.169169204 3 0.67473289 0.99707938 0.79982854
## Col-0    0.02343123  2.00000 0.006132875 3 0.01783395 0.02998687 0.02015342
## Cvi-0    0.74222076 25.66667 0.100593879 3 0.67115561 0.85732366 0.68466931
## Elh-46   0.94418855 35.00000 0.106757238 3 0.82161912 1.01686001 0.90785282
## F10-1-3  0.21769729 13.33333 0.025411560 3 0.18972397 0.23935647 0.20686770
## F13-8    0.20345644 10.66667 0.008912416 3 0.19354061 0.21079939 0.19978497
## F3-2     0.21904123 13.33333 0.018022718 3 0.19918331 0.23436145 0.21138112
## F9-2     0.21258758 12.66667 0.014430021 3 0.20189609 0.22900105 0.20438084
## FRI+FLC- 0.05532642  5.00000 0.008594284 3 0.04588852 0.06270173 0.05163877
## FRI+FLC+ 0.91460034 35.00000 0.079675515 3 0.86778546 1.00659686 0.86860207
## S1-1     0.75378822 27.66667 0.042816178 3 0.72176922 0.80242153 0.72947157
```

```
## S15-3    0.72724700 26.00000 0.139671822 3 0.58662538 0.86594925 0.65789588
## S5-10    1.48764719 42.66667 0.220606645 3 1.27717677 1.71715606 1.37289275
## Set-0    0.67054448 22.33333 0.031720320 3 0.63391776 0.68906172 0.66128586
## Set-6    1.44011075 42.33333 0.281750905 3 1.11520608 1.61709895 1.35161664
##                Q50        Q75
## Ait-14   4.18762724 4.31067432
## Ait-9    2.16258952 2.26895811
## Arb-0    0.92492419 0.96100179
## Col-0    0.02247289 0.02622988
## Cvi-0    0.69818300 0.77775333
## Elh-46   0.99408653 1.00547327
## F10-1-3  0.22401143 0.23168395
## F13-8    0.20602932 0.20841436
## F3-2     0.22357894 0.22897019
## F9-2     0.20686559 0.21793332
## FRI+FLC- 0.05738902 0.06004537
## FRI+FLC+ 0.86941868 0.93800777
## S1-1     0.73717392 0.76979772
## S15-3    0.72916638 0.79755781
## S5-10    1.46860873 1.59288240
## Set-0    0.68865395 0.68885783
## Set-6    1.58802720 1.60256308
##
## $comparison
## NULL
##
## $groups
##          df$Ratio groups
## Ait-14   50.00000      a
## Ait-9    47.00000     ab
## S5-10    42.66667    abc
## Set-6    42.33333    abc
## Elh-46   35.00000    bcd
## FRI+FLC+ 35.00000    bcd
## Arb-0    31.33333    cde
## S1-1     27.66667     de
## S15-3    26.00000     de
## Cvi-0    25.66667     de
## Set-0    22.33333     ef
## F10-1-3  13.33333     fg
## F3-2     13.33333     fg
## F9-2     12.66667     fg
## F13-8    10.66667     fg
## FRI+FLC-  5.00000      g
## Col-0     2.00000      g
##
## attr(,"class")
## [1] "group"
```