|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variety** | **Replicate** | **Treatment** | **Seedling height reading 1 (cm)** | **Seedling height reading 2 (cm)** | **Seedling height reading 3 (cm)** | **Seedling height after 12 days (cm)** | **Total root length (cm)** | **Seedling Dry weight (g)** | **Chlorophyll content** |
|
| 1 | 1 | 1 | 4.01 | 7.42 | 10.92 | 16.19 | 524.8505 | 0.1385 | 31.2 |
| 1 | 1 | 2 | 5.19 | 7.4 | 10.84 | 15.8 | 331.8647 | 0.106 | 32.3 |
| 1 | 1 | 3 | 5.1 | 7.85 | 11.08 | 15.97 | 415.0298 | 0.1053 | 31.8 |
| 1 | 1 | 4 | 5.21 | 7.92 | 11.09 | 16.14 | 504.7697 | 0.1263 | 30.2 |
| 1 | 2 | 1 | 3.96 | 7.51 | 11.01 | 16.19 | 555.7679 | 0.1259 | 30.8 |
| 1 | 2 | 2 | 5.12 | 7.36 | 10.76 | 15.9 | 365.8283 | 0.1157 | 31.9 |
| 1 | 2 | 3 | 5.13 | 7.91 | 10.93 | 16.08 | 440.4807 | 0.1108 | 31.9 |
| 1 | 2 | 4 | 5.26 | 8.03 | 11.05 | 16.1 | 561.2156 | 0.1129 | 31.3 |
| 1 | 3 | 1 | 4.12 | 7.78 | 11.04 | 16.09 | 594.7973 | 0.132 | 31.6 |
| 1 | 3 | 2 | 5.2 | 7.53 | 10.87 | 15.89 | 365.3519 | 0.1055 | 31.9 |
| 1 | 3 | 3 | 5.16 | 7.89 | 11.1 | 15.97 | 425.2335 | 0.1069 | 30.9 |
| 1 | 3 | 4 | 5.19 | 7.9 | 11.084 | 16.07 | 591.573 | 0.129 | 30.7 |
| 2 | 1 | 1 | 4.405 | 8.3 | 11.34 | 17.34 | 523.9601 | 0.3069 | 31.4 |
| 2 | 1 | 2 | 5.37 | 8.28 | 11.29 | 16.86 | 349.2549 | 0.12 | 31.3 |
| 2 | 1 | 3 | 5.28 | 8.31 | 11.3 | 17.06 | 359.4213 | 0.1105 | 30.1 |
| 2 | 1 | 4 | 5.24 | 8.4 | 11.41 | 17.2 | 517.168 | 0.2802 | 31.4 |
| 2 | 2 | 1 | 4.56 | 8.38 | 11.3 | 17.39 | 561.7569 | 0.295 | 31.8 |
| 2 | 2 | 2 | 5.35 | 8.3 | 11.27 | 16.89 | 296.8549 | 0.118 | 30.6 |
| 2 | 2 | 3 | 5.21 | 8.42 | 11.32 | 17.1 | 357.1178 | 0.195 | 32.1 |
| 2 | 2 | 4 | 5.28 | 8.56 | 11.39 | 17.18 | 541.3763 | 0.2981 | 31 |
| 2 | 3 | 1 | 4.544 | 8.34 | 11.38 | 17.29 | 563.3452 | 0.308 | 31.7 |
| 2 | 3 | 2 | 5.44 | 8.26 | 11.29 | 16.9 | 312.27 | 0.122 | 32.4 |
| 2 | 3 | 3 | 5.308 | 8.38 | 11.32 | 17.09 | 363.0746 | 0.126 | 32.3 |
| 2 | 3 | 4 | 5.28 | 8.41 | 11.51 | 17.13 | 558.853 | 0.297 | 31.4 |

V1 height 1

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The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Rep 3 1 2 3

Number of Observations Read 12

Number of Observations Used 12

The SAS System 22:29 Wednesday, December 9, 2018 62

The ANOVA Procedure

Dependent Variable: Height1

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 5 2.95902500 0.59180500 221.93 <.0001

Error 6 0.01600000 0.00266667

Corrected Total 11 2.97502500

R-Square Coeff Var Root MSE Height1 Mean

0.994622 1.056568 0.051640 4.887500

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 2.95342500 0.98447500 369.18 <.0001

Rep 2 0.00560000 0.00280000 1.05 0.4064

The SAS System 22:29 Wednesday, December 9, 2018 63

The ANOVA Procedure

t Tests (LSD) for Height1

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha 0.05

Error Degrees of Freedom 6

Error Mean Square 0.002667

Critical Value of t 2.44691

Least Significant Difference 0.1032

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 5.22000 3 4

A

A 5.17000 3 2

A

A 5.13000 3 3

B 4.03000 3 1

V1 height 2

The SAS System 22:29 Wednesday, December 9, 2018 64

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Rep 3 1 2 3

Number of Observations Read 12

Number of Observations Used 12

The SAS System 22:29 Wednesday, December 9, 2018 65

The ANOVA Procedure

Dependent Variable: Height2

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 5 3.66961667 0.73392333 67.80 <.0001

Error 6 0.06495000 0.01082500

Corrected Total 11 3.73456667

R-Square Coeff Var Root MSE Height2 Mean

0.982608 1.394993 0.104043 7.458333

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 3.63690000 1.21230000 111.99 <.0001

Rep 2 0.03271667 0.01635833 1.51 0.2941

The SAS System 22:29 Wednesday, December 9, 2018 66

The ANOVA Procedure

t Tests (LSD) for Height2

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha 0.05

Error Degrees of Freedom 6

Error Mean Square 0.010825

Critical Value of t 2.44691

Least Significant Difference 0.2079

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 7.95000 3 4

A

A 7.88333 3 3

B 7.43000 3 2

C 6.57000 3 1

V1 height 3

The SAS System 22:29 Wednesday, December 9, 2018 67

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Rep 3 1 2 3

Number of Observations Read 12

Number of Observations Used 12

The SAS System 22:29 Wednesday, December 9, 2018 68

The ANOVA Procedure

Dependent Variable: Height3

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 5 2.96694333 0.59338867 27.30 0.0005

Error 6 0.13040467 0.02173411

Corrected Total 11 3.09734800

R-Square Coeff Var Root MSE Height3 Mean

0.957898 1.378190 0.147425 10.69700

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 2.95721733 0.98573911 45.35 0.0002

Rep 2 0.00972600 0.00486300 0.22 0.8059

The SAS System 22:29 Wednesday, December 9, 2018 69

The ANOVA Procedure

t Tests (LSD) for Height3

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha 0.05

Error Degrees of Freedom 6

Error Mean Square 0.021734

Critical Value of t 2.44691

Least Significant Difference 0.2945

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 11.0747 3 4

A

A 11.0367 3 3

A

A 10.8233 3 2

B 9.8533 3 1

V1 height 4

The SAS System 22:29 Wednesday, December 9, 2018 79

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Rep 3 1 2 3

Number of Observations Read 12

Number of Observations Used 12

The SAS System 22:29 Wednesday, December 9, 2018 80

The ANOVA Procedure

Dependent Variable: Height4

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 5 1.78435833 0.35687167 29.12 0.0004

Error 6 0.07353333 0.01225556

Corrected Total 11 1.85789167

R-Square Coeff Var Root MSE Height4 Mean

0.960421 0.701737 0.110705 15.77583

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 1.75589167 0.58529722 47.76 0.0001

Rep 2 0.02846667 0.01423333 1.16 0.3747

The SAS System 22:29 Wednesday, December 9, 2018 81

The ANOVA Procedure

t Tests (LSD) for Height4

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha 0.05

Error Degrees of Freedom 6

Error Mean Square 0.012256

Critical Value of t 2.44691

Least Significant Difference 0.2212

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 16.10333 3 4

A

B A 16.00667 3 3

B

B 15.86333 3 2

C 15.13000 3 1

V2 height 1

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The ANOVA Procedure

Class Level Information

Class Levels Values

rep 3 1 2 3

trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 18:31 Wednesday, December 17, 2018 101

The ANOVA Procedure

Dependent Variable: height1

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 5 1.49116575 0.29823315 116.31 <.0001

Error 6 0.01538517 0.00256419

Corrected Total 11 1.50655092

R-Square Coeff Var Root MSE height1 Mean

0.989788 0.991814 0.050638 5.105583

Source DF Anova SS Mean Square F Value Pr > F

rep 2 0.00977817 0.00488908 1.91 0.2286

trt 3 1.48138758 0.49379586 192.57 <.0001

The SAS System 18:31 Wednesday, December 17, 2018 102

The ANOVA Procedure

t Tests (LSD) for height1

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha 0.05

Error Degrees of Freedom 6

Error Mean Square 0.002564

Critical Value of t 2.44691

Least Significant Difference 0.1012

Means with the same letter are not significantly different.

t Grouping Mean N trt

A 5.38667 3 2

B 5.26667 3 4

B

B 5.26600 3 3

C 4.50300 3 1

V2 height 2

The SAS System 18:31 Wednesday, December 17, 2018 103

The ANOVA Procedure

Class Level Information

Class Levels Values

rep 3 1 2 3

trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 18:31 Wednesday, December 17, 2018 104

The ANOVA Procedure

Dependent Variable: height2

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 5 0.06701667 0.01340333 10.12 0.0069

Error 6 0.00795000 0.00132500

Corrected Total 11 0.07496667

R-Square Coeff Var Root MSE height2 Mean

0.893953 0.435326 0.036401 8.361667

Source DF Anova SS Mean Square F Value Pr > F

rep 2 0.01831667 0.00915833 6.91 0.0277

trt 3 0.04870000 0.01623333 12.25 0.0057

The SAS System 18:31 Wednesday, December 17, 2018 105

The ANOVA Procedure

t Tests (LSD) for height2

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha 0.05

Error Degrees of Freedom 6

Error Mean Square 0.001325

Critical Value of t 2.44691

Least Significant Difference 0.0727

Means with the same letter are not significantly different.

t Grouping Mean N trt

A 8.45667 3 4

B 8.37000 3 3

B

C B 8.34000 3 1

C

C 8.28000 3 2

V2 height 3

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The ANOVA Procedure

Class Level Information

Class Levels Values

rep 3 1 2 3

trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 18:31 Wednesday, December 17, 2018 107

The ANOVA Procedure

Dependent Variable: height3

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 5 0.04613333 0.00922667 10.00 0.0071

Error 6 0.00553333 0.00092222

Corrected Total 11 0.05166667

R-Square Coeff Var Root MSE height3 Mean

0.892903 0.267718 0.030368 11.34333

Source DF Anova SS Mean Square F Value Pr > F

rep 2 0.00646667 0.00323333 3.51 0.0980

trt 3 0.03966667 0.01322222 14.34 0.0038

The SAS System 18:31 Wednesday, December 17, 2018 108

The ANOVA Procedure

t Tests (LSD) for height3

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha 0.05

Error Degrees of Freedom 6

Error Mean Square 0.000922

Critical Value of t 2.44691

Least Significant Difference 0.0607

Means with the same letter are not significantly different.

t Grouping Mean N trt

A 11.43667 3 4

B 11.34000 3 1

B

B 11.31333 3 3

B

B 11.28333 3 2

V2 height 4

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The ANOVA Procedure

Class Level Information

Class Levels Values

rep 3 1 2 3

trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 18:31 Wednesday, December 17, 2018 113

The ANOVA Procedure

Dependent Variable: height4

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 5 0.32767500 0.06553500 61.28 <.0001

Error 6 0.00641667 0.00106944

Corrected Total 11 0.33409167

R-Square Coeff Var Root MSE height4 Mean

0.980794 0.191028 0.032702 17.11917

Source DF Anova SS Mean Square F Value Pr > F

rep 2 0.00291667 0.00145833 1.36 0.3250

trt 3 0.32475833 0.10825278 101.22 <.0001

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The ANOVA Procedure

t Tests (LSD) for height4

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha 0.05

Error Degrees of Freedom 6

Error Mean Square 0.001069

Critical Value of t 2.44691

Least Significant Difference 0.0653

Means with the same letter are not significantly different.

t Grouping Mean N trt

A 17.34000 3 1

B 17.17000 3 4

C 17.08333 3 3

D 16.88333 3 2

Total root length v1

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The ANOVA Procedure

Class Level Information

Class Levels Values

rep 3 1 2 3

trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 18:31 Wednesday, December 17, 2018 47

The ANOVA Procedure

Dependent Variable: trtlenth

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 5 85258.09406 17051.61881 41.42 0.0001

Error 6 2470.00777 411.66796

Corrected Total 11 87728.10183

R-Square Coeff Var Root MSE trtlenth Mean

0.971845 4.247084 20.28960 477.7302

Source DF Anova SS Mean Square F Value Pr > F

rep 2 8277.64387 4138.82194 10.05 0.0121

trt 3 76980.45018 25660.15006 62.33 <.0001

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The ANOVA Procedure

t Tests (LSD) for trtlenth

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha 0.05

Error Degrees of Freedom 6

Error Mean Square 411.668

Critical Value of t 2.44691

Least Significant Difference 40.536

Means with the same letter are not significantly different.

t Grouping Mean N trt

A 558.47 3 1

A

A 552.52 3 4

B 426.91 3 3

C 373.01 3 2

Total root length v2

The SAS System 18:31 Wednesday, December 17, 2018 64

The ANOVA Procedure

Class Level Information

Class Levels Values

rep 3 1 2 3

trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 18:31 Wednesday, December 17, 2018 65

The ANOVA Procedure

Dependent Variable: trtlenth

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 5 128708.0652 25741.6130 51.34 <.0001

Error 6 3008.3240 501.3873

Corrected Total 11 131716.3893

R-Square Coeff Var Root MSE trtlenth Mean

0.977161 5.065558 22.39168 442.0378

Source DF Anova SS Mean Square F Value Pr > F

rep 2 330.6184 165.3092 0.33 0.7314

trt 3 128377.4468 42792.4823 85.35 <.0001

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The ANOVA Procedure

t Tests (LSD) for trtlenth

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha 0.05

Error Degrees of Freedom 6

Error Mean Square 501.3873

Critical Value of t 2.44691

Least Significant Difference 44.736

Means with the same letter are not significantly different.

t Grouping Mean N trt

A 549.69 3 1

A

A 539.13 3 4

B 359.87 3 3

B

B 319.46 3 2

**Dry weight v1**

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The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Rep 3 1 2 3

Number of Observations Read 12

Number of Observations Used 12

The SAS System 22:29 Wednesday, December 9, 2018 131

The ANOVA Procedure

Dependent Variable: Drywgt

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 5 0.00124189 0.00024838 5.06 0.0366

Error 6 0.00029443 0.00004907

Corrected Total 11 0.00153632

R-Square Coeff Var Root MSE Drywgt Mean

0.808353 5.941592 0.007005 0.117900

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 0.00122609 0.00040870 8.33 0.0147

Rep 2 0.00001580 0.00000790 0.16 0.8549

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The ANOVA Procedure

t Tests (LSD) for Drywgt

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha 0.05

Error Degrees of Freedom 6

Error Mean Square 0.000049

Critical Value of t 2.44691

Least Significant Difference 0.014

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 0.132133 3 1

A

B A 0.122733 3 4

B

B C 0.109067 3 2

C

C 0.107667 3 3

**Dry weight v2**

The SAS System 22:29 Wednesday, December 9, 2018 136

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Rep 3 1 2 3

Number of Observations Read 12

Number of Observations Used 12

The SAS System 22:29 Wednesday, December 9, 2018 137

The ANOVA Procedure

Dependent Variable: Drywgt

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 5 0.08333696 0.01666739 27.92 0.0004

Error 6 0.00358181 0.00059697

Corrected Total 11 0.08691877

R-Square Coeff Var Root MSE Drywgt Mean

0.958791 11.40083 0.024433 0.214308

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 0.08245871 0.02748624 46.04 0.0002

Rep 2 0.00087825 0.00043913 0.74 0.5179

The SAS System 22:29 Wednesday, December 9, 2018 138

The ANOVA Procedure

t Tests (LSD) for Drywgt

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha 0.05

Error Degrees of Freedom 6

Error Mean Square 0.000597

Critical Value of t 2.44691

Least Significant Difference 0.0488

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 0.30163 3 1

A

A 0.29177 3 4

B 0.14383 3 3

B

B 0.12000 3 2

**Core relation v1**