

**Changes in Seedling height according to the seed rate**

**Bg 374**

**Days after sowing**

**Core relation for V1**

The SAS System 18:31 Wednesday, December 17, 2018 1

The CORR Procedure

6 Variables: trt sheight sdrywgt totalrtln chrlcont spersqmtr

Simple Statistics

Variable N Mean Std Dev Sum Minimum Maximum

trt 12 2.50000 1.16775 30.00000 1.00000 4.00000

sheight 12 13.92083 3.59087 167.05000 9.55000 18.70000

sdrywgt 12 0.08262 0.02031 0.99145 0.05800 0.10800

totalrtln 12 229.61658 57.90442 2755 118.83160 320.38140

chrlcont 12 31.36667 1.64114 376.40000 29.30000 34.10000

spersqmtr 12 217.60795 37.36961 2611 168.52300 271.29320

Pearson Correlation Coefficients, N = 12

Prob > |r| under H0: Rho=0

trt sheight sdrywgt totalrtln chrlcont spersqmtr

trt 1.00000 -0.99045 -0.90536 -0.83578 -0.23244 0.99373

<.0001 <.0001 0.0007 0.4672 <.0001

sheight -0.99045 1.00000 0.94475 0.85458 0.25014 -0.98792

<.0001 <.0001 0.0004 0.4330 <.0001

sdrywgt -0.90536 0.94475 1.00000 0.87115 0.29898 -0.90598

<.0001 <.0001 0.0002 0.3452 <.0001

totalrtln -0.83578 0.85458 0.87115 1.00000 0.21893 -0.85723

0.0007 0.0004 0.0002 0.4942 0.0004

chrlcont -0.23244 0.25014 0.29898 0.21893 1.00000 -0.20292

0.4672 0.4330 0.3452 0.4942 0.5271

spersqmtr 0.99373 -0.98792 -0.90598 -0.85723 -0.20292 1.00000

<.0001 <.0001 <.0001 0.0004 0.5271

**Core relation for Core relation for V2**

The SAS System 18:31 Wednesday, December 17, 2018 2

The CORR Procedure

6 Variables: trt sheight sdrywgt totalrtln chrlcont spersqmtr

Simple Statistics

Variable N Mean Std Dev Sum Minimum Maximum

trt 12 2.50000 1.16775 30.00000 1.00000 4.00000

sheight 12 16.05833 3.67536 192.70000 10.32000 19.86000

sdrywgt 12 0.11605 0.02305 1.39259 0.08030 0.14900

totalrtln 12 338.57693 22.18014 4063 304.02600 372.87560

chrlcont 12 31.74167 1.79365 380.90000 29.50000 35.70000

spersqmtr 12 183.18944 34.77137 2198 138.56406 231.51674

Pearson Correlation Coefficients, N = 12

Prob > |r| under H0: Rho=0

trt sheight sdrywgt totalrtln chrlcont spersqmtr

trt 1.00000 -0.95804 -0.85149 -0.96519 0.13672 0.98857

<.0001 0.0004 <.0001 0.6718 <.0001

sheight -0.95804 1.00000 0.85279 0.92113 -0.32246 -0.94388

<.0001 0.0004 <.0001 0.3067 <.0001

sdrywgt -0.85149 0.85279 1.00000 0.88298 -0.13187 -0.80957

0.0004 0.0004 0.0001 0.6829 0.0014

totalrtln -0.96519 0.92113 0.88298 1.00000 -0.20182 -0.91934

<.0001 <.0001 0.0001 0.5293 <.0001

chrlcont 0.13672 -0.32246 -0.13187 -0.20182 1.00000 0.05189

0.6718 0.3067 0.6829 0.5293 0.8728

spersqmtr 0.98857 -0.94388 -0.80957 -0.91934 0.05189 1.00000

<.0001 <.0001 0.0014 <.0001

**Seedling height 1 V1**

The SAS System 05:18 Thursday, December 15, 2018 1

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 05:18 Thursday, December 15, 2018 2

The ANOVA Procedure

Dependent Variable: hieght1

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 3 2.55209167 0.85069722 607.64 <.0001

Error 8 0.01120000 0.00140000

Corrected Total 11 2.56329167

R-Square Coeff Var Root MSE hieght1 Mean

0.995631 0.638599 0.037417 5.859167

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 2.55209167 0.85069722 607.64 <.0001

The SAS System 05:18 Thursday, December 15, 2018 3

The ANOVA Procedure

t Tests (LSD) for hieght1

NOTE: This test controls the Type I comparison wise error rate, not the experiment wise error rate.

Alpha 0.05

Error Degrees of Freedom 8

Error Mean Square 0.0014

Critical Value of t 2.30600

Least Significant Difference 0.0704

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 6.36667 3 1

B 6.18333 3 2

C 5.71000 3 3

D 5.17667 3 4

**Seedling height 2 V1**

The SAS System 05:18 Thursday, December 15, 2018 4

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 05:18 Thursday, December 15, 2018 5

The ANOVA Procedure

Dependent Variable: hieght2

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 3 40.16669167 13.38889722 11727.5 <.0001

Error 8 0.00913333 0.00114167

Corrected Total 11 40.17582500

R-Square Coeff Var Root MSE hieght2 Mean

0.999773 0.424080 0.033789 7.967500

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 40.16669167 13.38889722 11727.5 <.0001

The SAS System 05:18 Thursday, December 15, 2018 6

The ANOVA Procedure

t Tests (LSD) for hieght2

NOTE: This test controls the Type I comparison wise error rate, not the experiment wise error rate.

Alpha 0.05

Error Degrees of Freedom 8

Error Mean Square 0.001142

Critical Value of t 2.30600

Least Significant Difference 0.0636

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 10.18000 3 1

B 9.28000 3 2

C 6.73333 3 3

D 5.67667 3 4

**Seedling height 3 V1**

The SAS System 05:18 Thursday, December 15, 2018 7

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 05:18 Thursday, December 15, 2018 8

The ANOVA Procedure

Dependent Variable: hieght3

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 3 136.3042250 45.4347417 14856.0 <.0001

Error 8 0.0244667 0.0030583

Corrected Total 11 136.3286917

R-Square Coeff Var Root MSE hieght3 Mean

0.999821 0.546419 0.055302 10.12083

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 136.3042250 45.4347417 14856.0 <.0001

The SAS System 05:18 Thursday, December 15, 2018 9

The ANOVA Procedure

t Tests (LSD) for hieght3

NOTE: This test controls the Type I comparison wise error rate, not the experiment wise error rate.

Alpha 0.05

Error Degrees of Freedom 8

Error Mean Square 0.003058

Critical Value of t 2.30600

Least Significant Difference 0.1041

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 14.85000 3 1

B 11.69000 3 2

C 7.59333 3 3

D 6.35000 3 4

**Seedling height 4 V1**

The SAS System 05:18 Thursday, December 15, 2018 13

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 05:18 Thursday, December 15, 2018 14

The ANOVA Procedure

Dependent Variable: hieght4

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 3 141.6703583 47.2234528 2257.69 <.0001

Error 8 0.1673333 0.0209167

Corrected Total 11 141.8376917

R-Square Coeff Var Root MSE hieght4 Mean

0.998820 1.038917 0.144626 13.92083

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 141.6703583 47.2234528 2257.69 <.0001

The SAS System 05:18 Thursday, December 15, 2018 15

The ANOVA Procedure

t Tests (LSD) for hieght4

NOTE: This test controls the Type I comparison wise error rate, not the experiment wise error rate.

Alpha 0.05

Error Degrees of Freedom 8

Error Mean Square 0.020917

Critical Value of t 2.30600

Least Significant Difference 0.2723

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 18.4367 3 1

B 15.8867 3 2

C 11.6700 3 3

D 9.6900 3 4

**Seedling height 1 V2**

The SAS System 05:18 Thursday, December 15, 2018 16

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 05:18 Thursday, December 15, 2018 17

The ANOVA Procedure

Dependent Variable: hieght1

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 3 2.15015833 0.71671944 627.78 <.0001

Error 8 0.00913333 0.00114167

Corrected Total 11 2.15929167

R-Square Coeff Var Root MSE hieght1 Mean

0.995770 0.492964 0.033789 6.854167

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 2.15015833 0.71671944 627.78 <.0001

The SAS System 05:18 Thursday, December 15, 2018 18

The ANOVA Procedure

t Tests (LSD) for hieght1

NOTE: This test controls the Type I comparison wise error rate, not the experiment wise error rate.

Alpha 0.05

Error Degrees of Freedom 8

Error Mean Square 0.001142

Critical Value of t 2.30600

Least Significant Difference 0.0636

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 7.36333 3 1

B 7.18000 3 2

C 6.47333 3 3

D 6.40000 3 4

**Seedling height 2 V2**

The SAS System 05:18 Thursday, December 15, 2018 19

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 05:18 Thursday, December 15, 2018 20

The ANOVA Procedure

Dependent Variable: hieght2

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 3 58.82442500 19.60814167 9804.07 <.0001

Error 8 0.01600000 0.00200000

Corrected Total 11 58.84042500

R-Square Coeff Var Root MSE hieght2 Mean

0.999728 0.448222 0.044721 9.977500

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 58.82442500 19.60814167 9804.07 <.0001

The SAS System 05:18 Thursday, December 15, 2018 21

The ANOVA Procedure

t Tests (LSD) for hieght2

NOTE: This test controls the Type I comparison wise error rate, not the experiment wise error rate.

Alpha 0.05

Error Degrees of Freedom 8

Error Mean Square 0.002

Critical Value of t 2.30600

Least Significant Difference 0.0842

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 12.25333 3 1

B 11.72333 3 2

C 9.25000 3 3

D 6.68333 3 4

**Seedling height 3 V2**

The SAS System 05:18 Thursday, December 15, 2018 22

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 05:18 Thursday, December 15, 2018 23

The ANOVA Procedure

Dependent Variable: hieght3

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 3 134.4644917 44.8214972 1238.16 <.0001

Error 8 0.2896000 0.0362000

Corrected Total 11 134.7540917

R-Square Coeff Var Root MSE hieght3 Mean

0.997851 1.457861 0.190263 13.05083

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 134.4644917 44.8214972 1238.16 <.0001

The SAS System 05:18 Thursday, December 15, 2018 24

The ANOVA Procedure

t Tests (LSD) for hieght3

NOTE: This test controls the Type I comparison wise error rate, not the experiment wise error rate.

Alpha 0.05

Error Degrees of Freedom 8

Error Mean Square 0.0362

Critical Value of t 2.30600

Least Significant Difference 0.3582

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 16.1200 3 1

A

A 15.7733 3 2

B 12.5233 3 3

C 7.7867 3 4

**Seedling height 4 V2**

The SAS System 05:18 Thursday, December 15, 2018 25

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 05:18 Thursday, December 15, 2018 26

The ANOVA Procedure

Dependent Variable: hieght4

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 3 148.4019667 49.4673222 2091.64 <.0001

Error 8 0.1892000 0.0236500

Corrected Total 11 148.5911667

R-Square Coeff Var Root MSE hieght4 Mean

0.998727 0.957668 0.153786 16.05833

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 148.4019667 49.4673222 2091.64 <.0001

The SAS System 05:18 Thursday, December 15, 2018 27

The ANOVA Procedure

t Tests (LSD) for hieght4

NOTE: This test controls the Type I comparison wise error rate, not the experiment wise error rate.

Alpha 0.05

Error Degrees of Freedom 8

Error Mean Square 0.02365

Critical Value of t 2.30600

Least Significant Difference 0.2896

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 19.6633 3 1

B 18.3433 3 2

C 15.7500 3 3

D 10.4767 3 4

**Dry weight - Bg 360**

The SAS System 20:26 Wednesday, December 8, 2018

61

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 20:26 Wednesday, December 8, 2018

62

The ANOVA Procedure

Dependent Variable: Drywgt

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 3 0.00436798 0.00145599 69.07 <.0001

Error 8 0.00016865 0.00002108

Corrected Total 11 0.00453663

R-Square Coeff Var Root MSE Drywgt Mean

0.962824 5.557260 0.004591 0.082621

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 0.00436798 0.00145599 69.07 <.0001

The SAS System 20:26 Wednesday, December 8, 2018

63

The ANOVA Procedure

t Tests (LSD) for Drywgt

NOTE: This test controls the Type I comparison wise error rate, not the experiment wise error rate.

Alpha 0.05

Error Degrees of Freedom 8

Error Mean Square 0.000021

Critical Value of t 2.30600

Least Significant Difference 0.0086

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 0.102283 3 1

A

A 0.101000 3 2

B 0.065600 3 3

B

B 0.061600 3 4

**Dry weight - Bg 374**

The SAS System 20:26 Wednesday, December 8, 2018

73

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 20:26 Wednesday, December 8, 2018

74

The ANOVA Procedure

Dependent Variable: Drywgt

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 3 0.00468366 0.00156122 10.76 0.0035

Error 8 0.00116086 0.00014511

Corrected Total 11 0.00584452

R-Square Coeff Var Root MSE Drywgt Mean

0.801377 10.38011 0.012046 0.116049

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 0.00468366 0.00156122 10.76 0.0035

The SAS System 20:26 Wednesday, December 8, 2018

75

The ANOVA Procedure

t Tests (LSD) for Drywgt

NOTE: This test controls the Type I comparison wise error rate, not the experiment wise error rate.

Alpha 0.05

Error Degrees of Freedom 8

Error Mean Square 0.000145

Critical Value of t 2.30600

Least Significant Difference 0.0227

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 0.141167 3 1

A

B A 0.119600 3 2

B

B 0.117633 3 3

C 0.085797 3 4

**Chlorophyll content Bg 360**

The SAS System 20:26 Wednesday, December 8, 2018

88

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 20:26 Wednesday, December 8, 2018 89

The ANOVA Procedure

Dependent Variable: Chrphl

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 3 2.51333333 0.83777778 0.25 0.8611

Error 8 27.11333333 3.38916667

Corrected Total 11 29.62666667

R-Square Coeff Var Root MSE Chrphl Mean

0.084833 5.869189 1.840969 31.36667

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 2.51333333 0.83777778 0.25 0.8611

**Chlorophyll content Bg 374**

The SAS System 20:26 Wednesday, December 8, 2018 91

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 20:26 Wednesday, December 8, 2018 92

The ANOVA Procedure

Dependent Variable: Chrphl

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 3 17.01583333 5.67194444 2.47 0.1364

Error 8 18.37333333 2.29666667

Corrected Total 11 35.38916667

R-Square Coeff Var Root MSE Chrphl Mean

0.480820 4.774405 1.515476 31.74167

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 17.01583333 5.67194444 2.47 0.1364

**Root length V1**

The SAS System 20:26 Wednesday, December 8, 2018 1

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 20:26 Wednesday, December 8, 2018 2

The ANOVA Procedure

Dependent Variable: Rootlength

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 3 26294.51752 8764.83917 5.98 0.0193

Error 8 11717.38520 1464.67315

Corrected Total 11 38011.90271

R-Square Coeff Var Root MSE Rootlength Mean

0.691744 16.77760 38.27105 228.1080

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 26294.51752 8764.83917 5.98 0.0193

The SAS System 20:26 Wednesday, December 8, 2018 3

The ANOVA Procedure

t Tests (LSD) for Rootlength

NOTE: This test controls the Type I comparison wise error rate, not the experiment wise error rate.

Alpha 0.05

Error Degrees of Freedom 8

Error Mean Square 1464.673

Critical Value of t 2.30600

Least Significant Difference 72.058

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 274.63 3 1

A

A 272.84 3 2

B 197.23 3 3

B

B 167.72 3 4

**Root length V2**

The SAS System 20:26 Wednesday, December 8, 2018 46

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 20:26 Wednesday, December 8, 2018 47

The ANOVA Procedure

Dependent Variable: Rootlength

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 3 8795.56212 2931.85404 6.11 0.0182

Error 8 3837.02239 479.62780

Corrected Total 11 12632.58451

R-Square Coeff Var Root MSE Rootlength Mean

0.696260 6.552229 21.90041 334.2436

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 8795.562116 2931.854039 6.11 0.0182

The SAS System 20:26 Wednesday, December 8, 2018 48

The ANOVA Procedure

t Tests (LSD) for Rootlength

NOTE: This test controls the Type I comparison wise error rate, not the experiment wise error rate.

Alpha 0.05

Error Degrees of Freedom 8

Error Mean Square 479.6278

Critical Value of t 2.30600

Least Significant Difference 41.235

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 368.49 3 1

A

A 339.01 3 3

A

A 336.83 3 2

B 292.65 3 4

**Number of seedlings per 25cm2 v1**

The SAS System 20:26 Wednesday, December 8, 2018 106

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 20:26 Wednesday, December 8, 2018 107

The ANOVA Procedure

Dependent Variable: numberofseedlings

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 3 38.00594005 12.66864668 254.98 <.0001

Error 8 0.39747860 0.04968483

Corrected Total 11 38.40341865

R-Square Coeff Var Root MSE numberofseedlings Mean

0.989650 2.048647 0.222901 10.88040

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 38.00594005 12.66864668 254.98 <.0001

The SAS System 20:26 Wednesday, December 8, 2018 108

The ANOVA Procedure

t Tests (LSD) for numberofseedlings

NOTE: This test controls the Type I comparison wise error rate, not the experiment wise error rate.

Alpha 0.05

Error Degrees of Freedom 8

Error Mean Square 0.049685

Critical Value of t 2.30600

Least Significant Difference 0.4197

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 13.3021 3 4

B 11.6885 3 3

C 9.9493 3 2

D 8.5817 3 1

**Number of seedlings per 25cm2 v2**

The SAS System 20:26 Wednesday, December 8, 2018 109

The ANOVA Procedure

Class Level Information

Class Levels Values

Trt 4 1 2 3 4

Number of Observations Read 12

Number of Observations Used 12

The SAS System 20:26 Wednesday, December 8, 2018 110

The ANOVA Procedure

Dependent Variable: numberofseedlings

Sum of

Source DF Squares Mean Square F Value Pr > F

Model 3 32.90740560 10.96913520 257.02 <.0001

Error 8 0.34142260 0.04267783

Corrected Total 11 33.24882820

R-Square Coeff Var Root MSE numberofseedlings Mean

0.989731 2.255437 0.206586 9.159472

Source DF Anova SS Mean Square F Value Pr > F

Trt 3 32.90740560 10.96913520 257.02 <.0001

The SAS System 20:26 Wednesday, December 8, 2018 111

The ANOVA Procedure

t Tests (LSD) for numberofseedlings

NOTE: This test controls the Type I comparison wise error rate, not the experiment wise error rate.

Alpha 0.05

Error Degrees of Freedom 8

Error Mean Square 0.042678

Critical Value of t 2.30600

Least Significant Difference 0.389

Means with the same letter are not significantly different.

t Grouping Mean N Trt

A 11.2960 3 4

B 10.1323 3 3

C 8.1631 3 2

D 7.0464 3 1