| Obs | block | variety | phosphorous | yield |
|---|---|---|---|---|
| **1** | 1 | 1 | 0 | 53.5 |
| **2** | 1 | 1 | 30 | 60.6 |
| **3** | 1 | 1 | 60 | 60.8 |
| **4** | 1 | 1 | 120 | 59.6 |
| **5** | 1 | 2 | 0 | 44.8 |
| **6** | 1 | 2 | 30 | 51.0 |
| **7** | 1 | 2 | 60 | 51.5 |
| **8** | 1 | 2 | 120 | 49.9 |
| **9** | 1 | 3 | 0 | 50.7 |
| **10** | 1 | 3 | 30 | 54.9 |
| **11** | 1 | 3 | 60 | 59.4 |
| **12** | 1 | 3 | 120 | 64.7 |
| **13** | 2 | 1 | 0 | 62.2 |
| **14** | 2 | 1 | 30 | 68.8 |
| **15** | 2 | 1 | 60 | 70.9 |
| **16** | 2 | 1 | 120 | 67.8 |
| **17** | 2 | 2 | 0 | 52.5 |
| **18** | 2 | 2 | 30 | 58.7 |
| **19** | 2 | 2 | 60 | 59.4 |
| **20** | 2 | 2 | 120 | 58.1 |
| **21** | 2 | 3 | 0 | 61.4 |
| **22** | 2 | 3 | 30 | 64.9 |
| **23** | 2 | 3 | 60 | 70.0 |
| **24** | 2 | 3 | 120 | 74.4 |
| **25** | 3 | 1 | 0 | 53.4 |
| **26** | 3 | 1 | 30 | 59.5 |
| **27** | 3 | 1 | 60 | 61.0 |
| **28** | 3 | 1 | 120 | 60.3 |
| **29** | 3 | 2 | 0 | 43.1 |
| **30** | 3 | 2 | 30 | 49.6 |
| **31** | 3 | 2 | 60 | 49.7 |
| **32** | 3 | 2 | 120 | 49.5 |
| **33** | 3 | 3 | 0 | 50.6 |
| **34** | 3 | 3 | 30 | 54.8 |

| Obs | block | variety | phosphorous | yield |
|---|---|---|---|---|
| **35** | 3 | 3 | 60 | 60.5 |
| **36** | 3 | 3 | 120 | 65.0 |

## *The GLM Procedure*

| Class Level Information | | |
|---|---|---|
| **Class** | **Levels** | **Values** |
| **block** | 3 | 1 2 3 |
| **variety** | 3 | 1 2 3 |
| **phosphorous** | 4 | 0 30 60 120 |

| | |
|---|---|
| **Number of Observations Read** | 36 |
| **Number of Observations Used** | 36 |

## *The GLM Procedure*

### *Dependent Variable: yield*

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 17 | 1967.406389 | 115.729788 | 510.99 | <.0001 |
| Error | 18 | 4.076667 | 0.226481 | | |
| Corrected Total | 35 | 1971.483056 | | | |

| R-Square | Coeff Var | Root MSE | yield Mean |
|---|---|---|---|
| 0.997932 | 0.820715 | 0.475901 | 57.98611 |

| Source | DF | Type I SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| variety | 2 | 763.2505556 | 381.6252778 | 1685.02 | <.0001 |
| block | 2 | 671.8072222 | 335.9036111 | 1483.14 | <.0001 |
| block*variety | 4 | 6.5627778 | 1.6406944 | 7.24 | 0.0012 |
| phosphorous | 3 | 408.3719444 | 136.1239815 | 601.04 | <.0001 |
| variety*phosphorous | 6 | 117.4138889 | 19.5689815 | 86.40 | <.0001 |

| Source | DF | Type III SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| variety | 2 | 763.2505556 | 381.6252778 | 1685.02 | <.0001 |
| block | 2 | 671.8072222 | 335.9036111 | 1483.14 | <.0001 |
| block*variety | 4 | 6.5627778 | 1.6406944 | 7.24 | 0.0012 |
| phosphorous | 3 | 408.3719444 | 136.1239815 | 601.04 | <.0001 |
| variety*phosphorous | 6 | 117.4138889 | 19.5689815 | 86.40 | <.0001 |

*The GLM Procedure*

| Source | Type III Expected Mean Square |
|---|---|
| **variety** | Var(Error) + 4 Var(block*variety) + Q(variety,variety*phosphorous) |
| **block** | Var(Error) + 4 Var(block*variety) + 12 Var(block) |
| **block*variety** | Var(Error) + 4 Var(block*variety) |
| **phosphorous** | Var(Error) + Q(phosphorous,variety*phosphorous) |
| **variety*phosphorous** | Var(Error) + Q(variety*phosphorous) |

## *The GLM Procedure*
## *Tests of Hypotheses for Mixed Model Analysis of Variance*

***Dependent Variable: yield***

| | Source | DF | Type III SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|---|
| * | variety | 2 | 763.250556 | 381.625278 | 232.60 | <.0001 |
| | block | 2 | 671.807222 | 335.903611 | 204.73 | <.0001 |
| | Error | 4 | 6.562778 | 1.640694 | | |

**Error: MS(block*variety)**

*** This test assumes one or more other fixed effects are zero.**

| | Source | DF | Type III SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|---|
| | block*variety | 4 | 6.562778 | 1.640694 | 7.24 | 0.0012 |
| * | phosphorous | 3 | 408.371944 | 136.123981 | 601.04 | <.0001 |
| | variety*phosphorous | 6 | 117.413889 | 19.568981 | 86.40 | <.0001 |
| | Error: MS(Error) | 18 | 4.076667 | 0.226481 | | |

*** This test assumes one or more other fixed effects are zero.**

***Least Squares Means***
***Standard Errors and Probabilities Calculated Using the Type III MS for block*variety as an Error Term***

| variety | yield LSMEAN | Standard Error | Pr > \|t\| |
|---|---|---|---|
| **1** | 61.5333333 | 0.3697628 | <.0001 |
| **2** | 51.4833333 | 0.3697628 | <.0001 |
| **3** | 60.9416667 | 0.3697628 | <.0001 |

### *Least Squares Means*

| phosphorous | yield LSMEAN | Standard Error | Pr > \|t\| |
|---|---|---|---|
| **0** | 52.4666667 | 0.1586336 | <.0001 |
| **30** | 58.0888889 | 0.1586336 | <.0001 |
| **60** | 60.3555556 | 0.1586336 | <.0001 |
| **120** | 61.0333333 | 0.1586336 | <.0001 |

| variety | phosphorous | yield LSMEAN | Standard Error | Pr > \|t\| |
|---|---|---|---|---|
| **1** | **0** | 56.3666667 | 0.2747614 | <.0001 |
| **1** | **30** | 62.9666667 | 0.2747614 | <.0001 |
| **1** | **60** | 64.2333333 | 0.2747614 | <.0001 |
| **1** | **120** | 62.5666667 | 0.2747614 | <.0001 |
| **2** | **0** | 46.8000000 | 0.2747614 | <.0001 |
| **2** | **30** | 53.1000000 | 0.2747614 | <.0001 |
| **2** | **60** | 53.5333333 | 0.2747614 | <.0001 |
| **2** | **120** | 52.5000000 | 0.2747614 | <.0001 |
| **3** | **0** | 54.2333333 | 0.2747614 | <.0001 |
| **3** | **30** | 58.2000000 | 0.2747614 | <.0001 |
| **3** | **60** | 63.3000000 | 0.2747614 | <.0001 |
| **3** | **120** | 68.0333333 | 0.2747614 | <.0001 |

## *The Mixed Procedure*

| Model Information | |
|---|---|
| **Data Set** | WORK.EX18_1 |
| **Dependent Variable** | yield |
| **Covariance Structure** | Variance Components |
| **Estimation Method** | REML |
| **Residual Variance Method** | Profile |
| **Fixed Effects SE Method** | Model-Based |
| **Degrees of Freedom Method** | Containment |

| Class Level Information | | |
|---|---|---|
| **Class** | **Levels** | **Values** |
| **block** | 3 | 1 2 3 |
| **variety** | 3 | 1 2 3 |
| **phosphorous** | 4 | 0 30 60 120 |

| Dimensions | |
|---|---|
| **Covariance Parameters** | 3 |
| **Columns in X** | 20 |
| **Columns in Z** | 12 |
| **Subjects** | 1 |
| **Max Obs Per Subject** | 36 |

| Number of Observations | |
|---|---|
| **Number of Observations Read** | 36 |
| **Number of Observations Used** | 36 |
| **Number of Observations Not Used** | 0 |

| Iteration History | | | |
|---|---|---|---|
| **Iteration** | **Evaluations** | **-2 Res Log Like** | **Criterion** |
| **0** | 1 | 161.63553025 | |
| **1** | 1 | 68.17486618 | 0.00000000 |

## *The Mixed Procedure*

Convergence criteria met.

| Covariance Parameter Estimates | |
|---|---|
| **Cov Parm** | **Estimate** |
| **block** | 27.8552 |
| **block*variety** | 0.3536 |
| **Residual** | 0.2265 |

| Fit Statistics | |
|---|---|
| **-2 Res Log Likelihood** | 68.2 |
| **AIC (smaller is better)** | 74.2 |
| **AICC (smaller is better)** | 75.4 |
| **BIC (smaller is better)** | 71.5 |

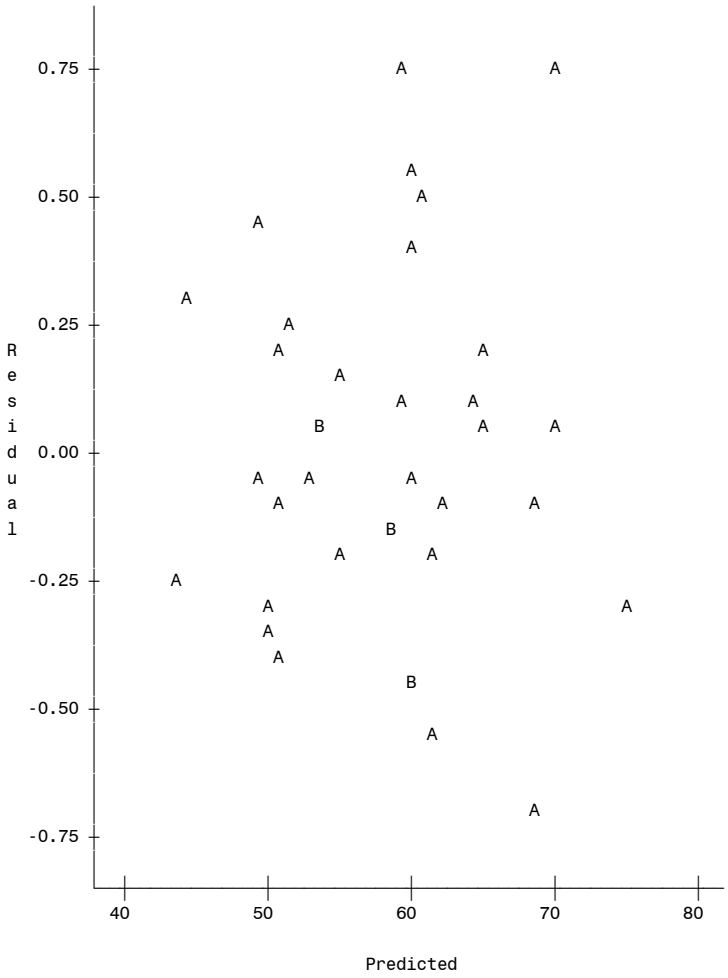
| Type 3 Tests of Fixed Effects | | | | |
|---|---|---|---|---|
| **Effect** | **Num DF** | **Den DF** | **F Value** | **Pr > F** |
| **variety** | 2 | 4 | 232.60 | <.0001 |
| **phosphorous** | 3 | 18 | 601.04 | <.0001 |
| **variety*phosphorous** | 6 | 18 | 86.40 | <.0001 |

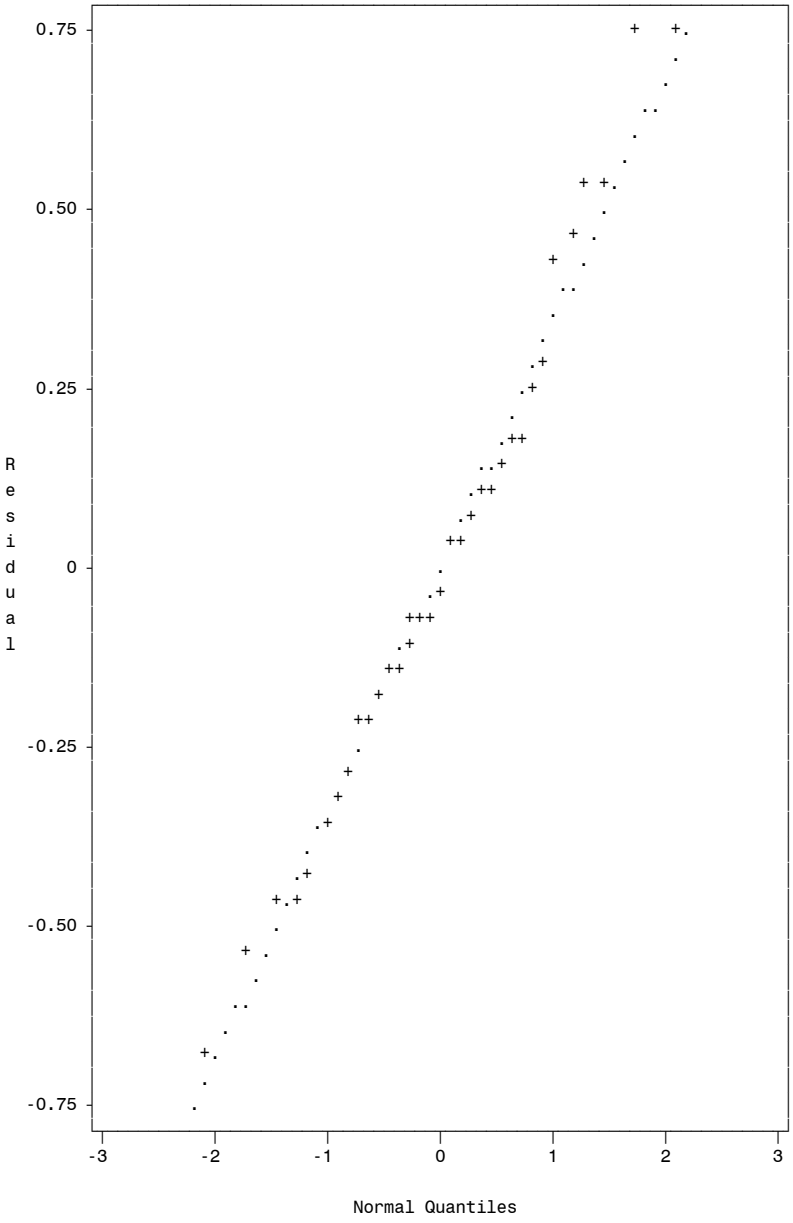
| Least Squares Means | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Effect** | **variety** | **phosphorous** | **Estimate** | **Standard Error** | **DF** | **t Value** | **Pr > \|t\|** |
| **variety** | 1 | | 61.5333 | 3.0695 | 4 | 20.05 | <.0001 |
| **variety** | 2 | | 51.4833 | 3.0695 | 4 | 16.77 | <.0001 |
| **variety** | 3 | | 60.9417 | 3.0695 | 4 | 19.85 | <.0001 |
| **phosphorous** | | 0 | 52.4667 | 3.0577 | 18 | 17.16 | <.0001 |
| **phosphorous** | | 30 | 58.0889 | 3.0577 | 18 | 19.00 | <.0001 |
| **phosphorous** | | 60 | 60.3556 | 3.0577 | 18 | 19.74 | <.0001 |
| **phosphorous** | | 120 | 61.0333 | 3.0577 | 18 | 19.96 | <.0001 |
| **variety*phosphorous** | 1 | 0 | 56.3667 | 3.0787 | 18 | 18.31 | <.0001 |
| **variety*phosphorous** | 1 | 30 | 62.9667 | 3.0787 | 18 | 20.45 | <.0001 |

*The Mixed Procedure*

| Least Squares Means | | | | | | | |
|---|---|---|---|---|---|---|---|
| Effect | variety | phosphorous | Estimate | Standard Error | DF | t Value | Pr > \|t\| |
| variety*phosphorous | 1 | 60 | 64.2333 | 3.0787 | 18 | 20.86 | <.0001 |
| variety*phosphorous | 1 | 120 | 62.5667 | 3.0787 | 18 | 20.32 | <.0001 |
| variety*phosphorous | 2 | 0 | 46.8000 | 3.0787 | 18 | 15.20 | <.0001 |
| variety*phosphorous | 2 | 30 | 53.1000 | 3.0787 | 18 | 17.25 | <.0001 |
| variety*phosphorous | 2 | 60 | 53.5333 | 3.0787 | 18 | 17.39 | <.0001 |
| variety*phosphorous | 2 | 120 | 52.5000 | 3.0787 | 18 | 17.05 | <.0001 |
| variety*phosphorous | 3 | 0 | 54.2333 | 3.0787 | 18 | 17.62 | <.0001 |
| variety*phosphorous | 3 | 30 | 58.2000 | 3.0787 | 18 | 18.90 | <.0001 |
| variety*phosphorous | 3 | 60 | 63.3000 | 3.0787 | 18 | 20.56 | <.0001 |
| variety*phosphorous | 3 | 120 | 68.0333 | 3.0787 | 18 | 22.10 | <.0001 |

Plot of Resid*Pred. Legend: A = 1 obs, B = 2 obs, etc.






Normal Line: ... Mu=0, Sigma=0.3465
Observations: + (2 Hidden)