Appendix 12

**ANOVA – Average RGB Values**

# Variance Due to Varying Drop Height

For each characteristic, ANOVA was performed using a 0.05 (5%) level of significance, i.e. if the *p*-value obtained was less than 0.05, there would be a significant level of variance.

# Red Values

Ho: There is no difference between the red values obtained as drop height is varied.

Ha: There is a difference between the red values obtained as drop height is varied.

Dataset Used For Calculation:

|  |  |  |  |
| --- | --- | --- | --- |
| **Drop Height** | **5 cm** | **4 cm** | **3cm** |
| **Average Red Values** | 193.0 | 183.4 | 182.4 |
| 198.6 | 195.0 | 202.2 |
| 201.8 | 196.2 | 203.8 |
| 172.3 | 173.0 | 172.3 |
| 189.5 | 178.5 | 186.0 |
| 157.7 | 158.0 | 160.3 |
| 208.0 | 192.0 | 209.0 |
| 194.8 | 191.6 | 195.5 |
| 185.0 | 181.3 | 189.3 |
| 176.0 | 171.0 | 171.0 |
| 197.0 | 197.0 | 198.5 |
| 195.0 | 190.5 | 191.0 |

**Results:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Anova: Single Factor |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| SUMMARY |  |  |  |  |  |  |
| *Groups* | *Count* | *Sum* | *Average* | *Variance* |  |  |
| 5 cm | 12 | 2268.7 | 189.0583 | 200.9481 |  |  |
| 4 cm | 12 | 2207.5 | 183.9583 | 146.0663 |  |  |
| 3 cm | 12 | 2261.3 | 188.4417 | 218.6608 |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| ANOVA |  |  |  |  |  |  |
| *Source of Variation* | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
| Between Groups | 185.9622 | 2 | 92.98111 | 0.493116 | 0.615149 | 3.284918 |
| Within Groups | 6222.428 | 33 | 188.5584 |  |  |  |
|  |  |  |  |  |  |  |
| Total | 6408.39 | 35 |  |  |  |  |

**Conclusion:**

As the *p­* > 0.05, H0 is accepted and Ha rejected. Therefore there is no significant difference between the red values obtained as drop height is varied.

# Green Values

Ho: There is no difference between the green values obtained as drop height is varied.

Ha: There is a difference between the green values obtained as drop height is varied.

Dataset Used For Calculation:

|  |  |  |  |
| --- | --- | --- | --- |
| **Drop Height** | **5 cm** | **4 cm** | **3cm** |
| **Average Red Values** | 184.4 | 173.8 | 156.8 |
| 195.8 | 189.6 | 199.2 |
| 199.2 | 190.0 | 200.8 |
| 168.0 | 170.0 | 172.0 |
| 183.0 | 172.5 | 183.5 |
| 153.0 | 157.0 | 157.0 |
| 205.5 | 191.0 | 208.5 |
| 190.6 | 189.4 | 192.0 |
| 180.0 | 177.3 | 185.3 |
| 175.0 | 170.0 | 172.0 |
| 192.0 | 191.5 | 192.0 |
| 191.0 | 188.0 | 191.0 |

**Results:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Anova: Single Factor |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| SUMMARY |  |  |  |  |  |  |
| *Groups* | *Count* | *Sum* | *Average* | *Variance* |  |  |
| 5 cm | 12 | 2217.5 | 184.7917 | 208.7936 |  |  |
| 4 cm | 12 | 2160.1 | 180.0083 | 129.8863 |  |  |
| 3 cm | 12 | 2210.1 | 184.175 | 277.1766 |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| ANOVA |  |  |  |  |  |  |
| *Source of Variation* | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
| Between Groups | 162.4867 | 2 | 81.24333 | 0.395758 | 0.676322 | 3.284918 |
| Within Groups | 6774.421 | 33 | 205.2855 |  |  |  |
|  |  |  |  |  |  |  |
| Total | 6936.908 | 35 |  |  |  |  |

**Conclusion:**

As the *p­* > 0.05, H0 is accepted and Ha rejected. Therefore there is no significant difference between the green values obtained as drop height is varied.

# Blue Values

Ho: There is no difference between the blue values obtained as drop height is varied.

Ha: There is a difference between the blue values obtained as drop height is varied.

Dataset Used For Calculation:

|  |  |  |  |
| --- | --- | --- | --- |
| **Drop Height** | **5 cm** | **4 cm** | **3cm** |
| **Average Red Values** | 32.5 | 29.8 | 30.2 |
| 31.6 | 37.6 | 36.2 |
| 14.8 | 22.6 | 16.4 |
| 36.7 | 41.7 | 37.0 |
| 0.0 | 0.0 | 0.0 |
| 32.3 | 43.7 | 40.7 |
| 0.0 | 0.0 | 0.0 |
| 27.0 | 23.8 | 21.4 |
| 33.8 | 42.3 | 39.0 |
| 30.0 | 40.0 | 25.0 |
| 18.0 | 103.0 | 15.0 |
| 82.5 | 90.0 | 80.5 |

**Results:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Anova: Single Factor |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| SUMMARY |  |  |  |  |  |  |
| *Groups* | *Count* | *Sum* | *Average* | *Variance* |  |  |
| 5 cm | 12 | 339.2 | 28.26667 | 452.5152 |  |  |
| 4 cm | 12 | 474.5 | 39.54167 | 942.1227 |  |  |
| 3 cm | 12 | 341.4 | 28.45 | 464.8464 |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| ANOVA |  |  |  |  |  |  |
| *Source of Variation* | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
| Between Groups | 1000.737 | 2 | 500.3686 | 0.80727 | 0.454688 | 3.284918 |
| Within Groups | 20454.33 | 33 | 619.8281 |  |  |  |
|  |  |  |  |  |  |  |
| Total | 21455.06 | 35 |  |  |  |  |

**Conclusion:**

As the *p­* > 0.05, H0 is accepted and Ha rejected. Therefore there is no significant difference between the blue values obtained as drop height is varied.