1. **The following table represents the layout of R.B.D of 4 treatments (fertilizers) which is measured under 4 different conditions.**

**Conditions**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Treatments** | **I** | **II** | **III** | **IV** |
| **A** | **16** | **19** | **18** | **10** |
| **B** | **11** | **17** | **15** | **9** |
| **C** | **8** | **19** | **11** | **17** |
| **D** | **10** | **15** | **8** | **18** |

**Carry out the analysis of the design.**

**Hypothesis:**

**H0T: There is no significance difference between treatments.**

**H1T: There is significance difference between treatments.**

**H0B : There is no significant difference between blocks.**

**H1B : There is significant difference between blocks.**

**Level of significance,**

**Alpha = 5%**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Test statistics:** | | |  |  |  |  |
|  |  |  |  |  |  |  |
| ***SUMMARY*** | ***Count*** | ***Sum*** | ***Average*** | ***Variance*** |  |  |
| **A** | **4** | **63** | **15.75** | **16.25** |  |  |
| **B** | **4** | **52** | **13** | **13.33333** |  |  |
| **C** | **4** | **55** | **13.75** | **26.25** |  |  |
| **D** | **4** | **51** | **12.75** | **20.91667** |  |  |
|  |  |  |  |  |  |  |
| **1** | **4** | **45** | **11.25** | **11.58333** |  |  |
| **2** | **4** | **70** | **17.5** | **3.666667** |  |  |
| **3** | **4** | **52** | **13** | **19.33333** |  |  |
| **4** | **4** | **54** | **13.5** | **21.66667** |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **ANOVA** |  |  |  |  |  |  |
| ***Source of Variation*** | ***SS*** | ***df*** | ***MS*** | ***F*** | ***P-value*** | ***F crit*** |
| **treatment** | **22.1875** | **3** | **7.395833** | **0.454158** | **0.720775** | **3.862548** |
| **Block** | **83.6875** | **3** | **27.89583** | **1.713006** | **0.233458** | **3.862548** |
| **Error** | **146.5625** | **9** | **16.28472** |  |  |  |
|  |  |  |  |  |  |  |
| **Total** | **252.4375** | **15** |  |  |  |  |

**Decision:**

**Since in both cases, fcal < ftab, so we accept H0**

**i.e. There is no significance difference between treatments and blocks.**

1. **The following table gives the result of the experiment on four varieties of a crop in 5 blocks of plot.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Block I** | **Block II** | **Block III** | **Block IV** | **Block V** |
| **A 32** | **B 33** | **D 30** | **A 35** | **C 36** |
| **B 34** | **C 34** | **C 35** | **C 32** | **D 29** |
| **C 31** | **A 34** | **B 36** | **B 37** | **A 37** |
| **D 29** | **D 26** | **A 33** | **D 28** | **B 35** |

**Analyse the above result to test whether there is significant difference between yields of four varieties and also test whether blocks are homogenous or not.**

**Hypothesis:**

**H0T : There is no significant difference between treatments.**

**H1T : There is significant difference between treatments.**

**H0B : There is no significant difference between blocks.**

**H1B : There is significant difference between blocks.**

**Level of significance:**

**α=5%**

**Test statistics:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Anova: Two-Factor Without Replication** | | |  |  |  |  |
|  |  |  |  |  |  |  |
| ***SUMMARY*** | ***Count*** | ***Sum*** | ***Average*** | ***Variance*** |  |  |
| **A** | **5** | **171** | **34.2** | **3.7** |  |  |
| **B** | **5** | **175** | **35** | **2.5** |  |  |
| **C** | **5** | **168** | **33.6** | **4.3** |  |  |
| **D** | **5** | **148** | **29.6** | **11.3** |  |  |
|  |  |  |  |  |  |  |
| **I** | **4** | **126** | **31.5** | **4.333333** |  |  |
| **II** | **4** | **127** | **31.75** | **14.91667** |  |  |
| **III** | **4** | **134** | **33.5** | **7** |  |  |
| **IV** | **4** | **132** | **33** | **15.33333** |  |  |
| **V** | **4** | **143** | **35.75** | **0.916667** |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **ANOVA** |  |  |  |  |  |  |
| ***Source of Variation*** | ***SS*** | ***df*** | ***MS*** | ***F*** | ***P-value*** | ***F crit*** |
| **treatments** | **86.6** | **3** | **28.86667** | **8.469438** | **0.00272** | **3.490295** |
| **Blocks** | **46.3** | **4** | **11.575** | **3.396088** | **0.044567** | **3.259167** |
| **Error** | **40.9** | **12** | **3.408333** |  |  |  |
|  |  |  |  |  |  |  |
| **Total** | **173.8** | **19** |  |  |  |  |

**Decision:**

**In both cases, fcal> ftab, so we reject H0**

**Hence we conclude that there is significant difference between treatments and blocks.**