Agricultural Statistics in Practice

Analysis of Variance (ANOVA)

One – Way Classification

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One – Way ANOVA

- The one-way analysis of variance (one-way ANOVA) can be viewed as an extension of the t-test for independent samples. It is applicable when there are two or more independent groups.

- The ***independent variable*** is a categorical variable that determines the groups being compared.

- The ***dependent variable*** is a measured variable, whose means are being compared.

Utility of the test

- The one-way ANOVA assesses the means of the groups of interest and determines if there are significant differences among them. It specifically tests the null hypothesis.

$$H_0: \mu_1 = \mu_2 = \mu_3 = \cdots = \mu_k$$
$$\mu = group\ mean\ \&$$
$$k = number\ of\ groups$$

- If the one-way ANOVA yields a significant result, we accept the alternative hypothesis (HA) that there are significant differences between at least two group means.

Assumptions for One – Way ANOVA Test

1. The dependent variable should be measured on interval or ratio scales, indicating continuity.

2. The independent variable should consist of two or more categorical, independent groups. Usually, a one-way ANOVA is used for three or more groups, but it can be used for two groups as well (though an independent-samples t-test is more common in that case).

3. Observations should be independent, with no relationship within or between the groups.

of shape size

day 1 2 3 4 5

1 8 15 22 29. – – – – – –

Assumptions for One – Way ANOVA Test

4. Significant outliers should be absent. Outliers are individual data points that deviate from the normal pattern.

5. The dependent variable should be approximately normally distributed within each category of the independent variable. While the one-way ANOVA is robust to violations of normality.

6. Homogeneity of variances is necessary, ensuring that the variance is consistent across the different groups.
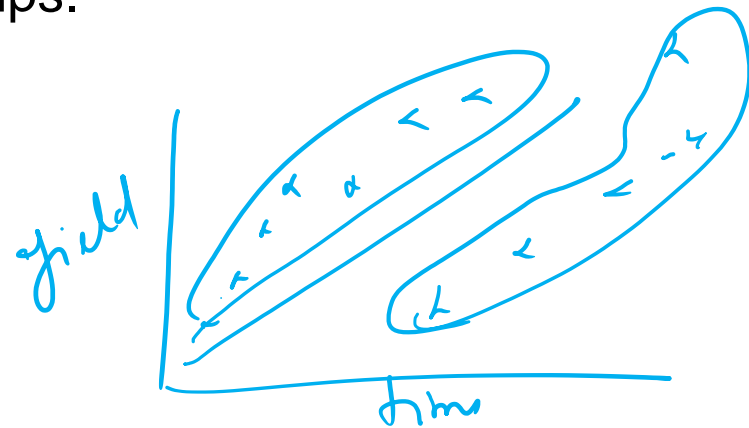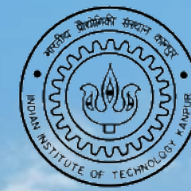
Limitations

- Normality: Each sample is assumed to be drawn from a population that follows a normal distribution.

- Sample independence: Each sample is independent and unrelated to the other samples.

- Variance equality: The variance of data in the different groups should be approximately equal.

- Dependent variable: The dependent variable, such as "weight," should be continuous and measured on a scale with meaningful increments (e.g., grams, milligrams).

Thank You