

Design of Experiments

Lect.19

Need of Design of Experiments:

- The design of experiment is needed to provide the experimenter the means by which the experimenter shall be able to detect certain specified differences between treatments.
- It is possible to get maximum information out of possible resources.

PRINCIPLES OF DESIGNS OF EXPERIMENT

1.LOCAL CONTROL:

Making the experimental material homogeneous or making homogeneous groups out of heterogenous material.

2. REPLIATION:

Repetition of the same trial.

Increase in the replications increases efficiency of the experiment.

3.Randomisation:

Allotment of the experimental units to the treatments in random order.

Eliminates the biasness and minimizes error.

Randomization:

- Avoids bias in the allotment of treatments to experimental units.
- All the units are not identical in nature hence we need randomization.
- The process consists of in providing equal chance to all experimental units to be put under any particular treatment.

Replication:

- The repetition of treatments by applying them to more than one experimental units.
- It is necessary to have estimate of the experimental error variation.(MESS or S_e^2)
- It increases precision also.

Local Control:

- The reduction of experimental error can be achieved by forming homogeneous blocks of experimental units and then treatments are allotted randomly to different units in each block.
- The aim of local control is to reduce the error by suitably modifying the allocation of treatments to experimental units.
- Note: This is applicable only to Randomized block design

Completely Randomized Design (CRD)

- Uses two basic principles- **Randomization & Replication.**
- Whole material is supposed to be **homogeneous** and is divided into number of experimental units depending on the number of replications and number of treatments for each treatment.
- The treatments are then allotted randomly to the units in the entire material.
- Analysis of CRD is same as one way classification.

Advantages:

- It is applicable where experimental units are homogenous.
- It provides maximum d.f. for estimation of expt. error.
- Not necessary no.of replications for each treatment is same.

Disadvantage: Local control is absent –expt. error inflated –by entire variation.

Randomized Block Design (RBD):

- Uses all the **three principles**.
- Necessary Condition: $N = h \cdot k$ where,
k= number of treatments and h= number of levels of second assignable cause or factor.
- Experimental units are divided into homogeneous groups called **blocks**. To control variability in one direction in expt. material.
- It is an arrangement of **k treatments** in **h blocks** such that each treatment occurs once and only once in each block.
- The randomization of treatment is done independently in each block.
- Analysis of RBD is same as two way classification.