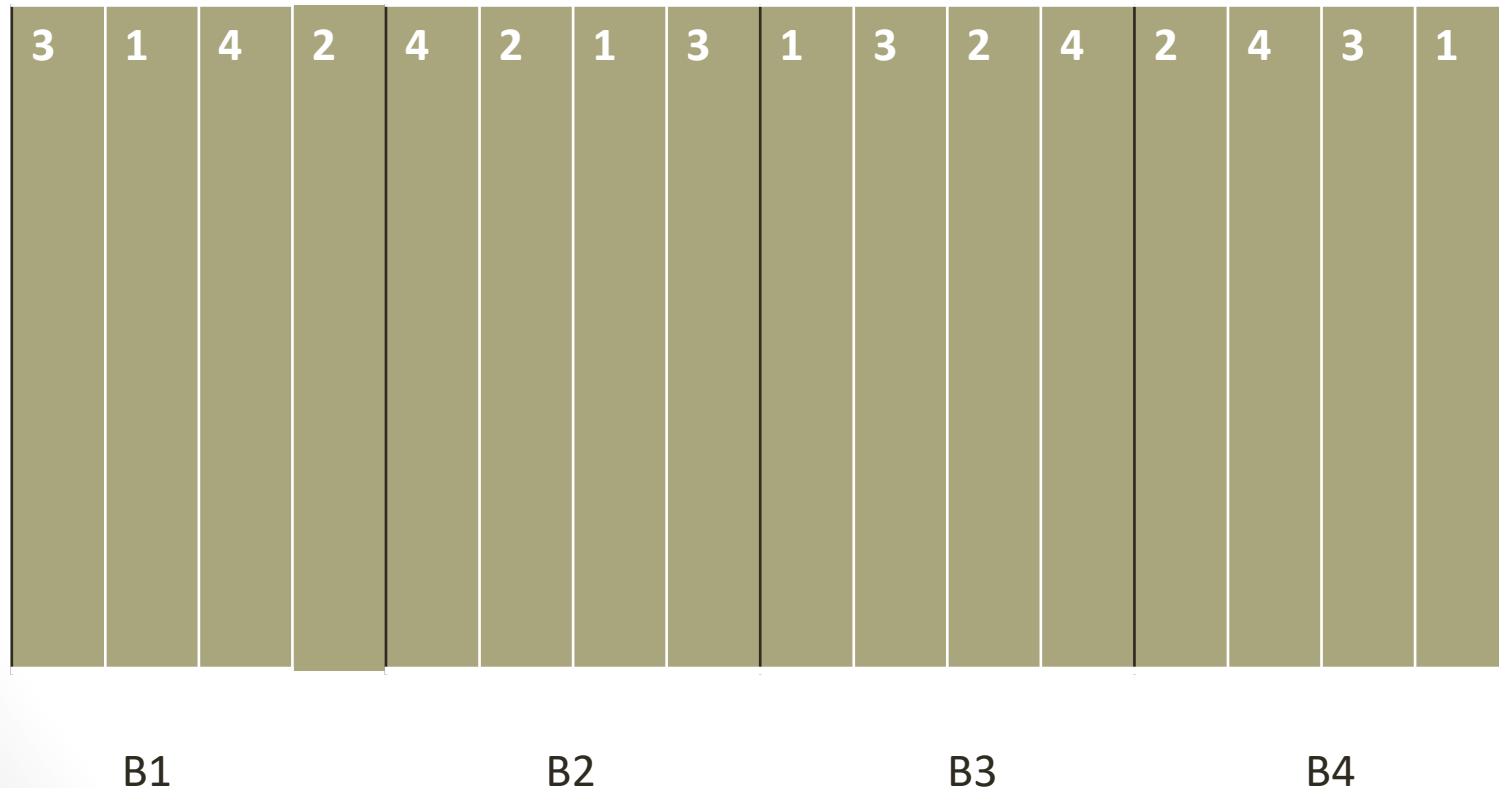


Randomised block designs

Veronique Storme

Eg. 1 Yield in 4 maize cultivars

- Model: response \sim cv + block



Eg. 2 Pig feeding experiment

- Each room contains 12 pens
- Each pen holds 20 pigs (equal gender distribution)
- 3 weight blocks
- Diet randomly allocated over the weight blocks
- Model: response \sim diet + weight block

diet 2	diet 4	diet 3
diet 3	diet 1	diet 2
diet 1	diet 2	diet 4
diet 4	diet 3	diet 1

heavy

medium

light

Eg. 3 Sampling roots for RNAseq

- Model: $\text{response} \sim T + GT + T*GT + \text{day}$

25 wt	25 mt	25 wt	25 mt	25 wt	25 mt	25 wt	25 mt
25 wt	25 mt	25 wt	25 mt	25 wt	25 mt	25 wt	25 mt

25 wt	25 mt	25 wt	25 mt	25 wt	25 mt	25 wt	25 mt
25 wt	25 mt	25 wt	25 mt	25 wt	25 mt	25 wt	25 mt

25 wt	25 mt	25 wt	25 mt	25 wt	25 mt	25 wt	25 mt
25 wt	25 mt	25 wt	25 mt	25 wt	25 mt	25 wt	25 mt

Day 1

- BR1 wt control
- BR1 wt treated
- BR1 mt control
- BR1 mt treated

Day 2

- BR2 wt control
- BR2 wt treated
- BR2 mt control
- BR1 mt treated

Day 3

- BR3 wt control
- BR3 wt treated
- BR3 mt control
- BR3 mt treated

Eg. 4 seedling emergence example

- Compare 5 seed disinfectant treatments using a RCBD with 4 blocks.
 - 100 seeds planted per plot
 - Response: # plants that emerged in each plot

control	Arasan	Fermate	Semesan
Arasan	Semesan	control	Spergon
Spergon	control	Arasan	Fermate
Semesan	Fermate	Spergon	Arasan
Fermate	Spergon	Semesan	control
B1	B2	B3	B4

Two-way anova table without replication

Source of variation	Degrees of freedom	Sum of squares	Mean square	F-ratio
treatment	a-1	SS_T	$MS_T = SS_T / (a-1)$	$F_T = MS_T / MS_E$
block	b-1	SS_B	$MS_B = SS_B / (b-1)$	$F_B = MS_B / MS_E$
Error	$(a-1)(b-1)$	SS_E	$MS_E = SS_E / (a-1)(b-1)$	

F test for block variability

- Even if there appears to be a non-significant difference, keep block into the model to reflect the design

Fixed vs random block effect

- Subject to debate
- The choice fixed versus random blocks does not affect the testing of the treatment effect (except in more complicated designs)
- Different interpretation (generalizability)
- Advantage random: more error degrees of freedom left



DEMO RCB

Open the program `Ch13_RCB.R`

exercise

- Mycelial growth is measured in terms of diameter of the colony (mm) of 5 *Rhizoctonia solani* isolates on PDA medium after 14 hours of incubation. The experiment is replicated 3 times. Is there a significant difference in growth between the 5 isolates. If yes, between which isolates do you detect a significant difference at a familywise error rate of 0.05? You may assume that all necessary assumptions are met.
- The data:
 - `isolates = rep(c("RS1", "RS2", "RS3", "RS4", "RS5"), 3)`
 - `repl = c(rep(1, 5), rep(2, 5), rep(3, 5))`
 - `growth =`
`c(29.0, 33.5, 26.5, 48.5, 34.5, 28.0, 31.5, 30.0, 46.5, 31.0, 29.0, 29.0, 28.0,`
`49.0, 32.0)`
 - `mgrowth = data.frame(isolates, repl, growth)`