RCBD: Power Calculation [ST&D 241]

(ST&D 207) Percent oil in flax seed harvested from plants inoculated with rust disease at different stages.

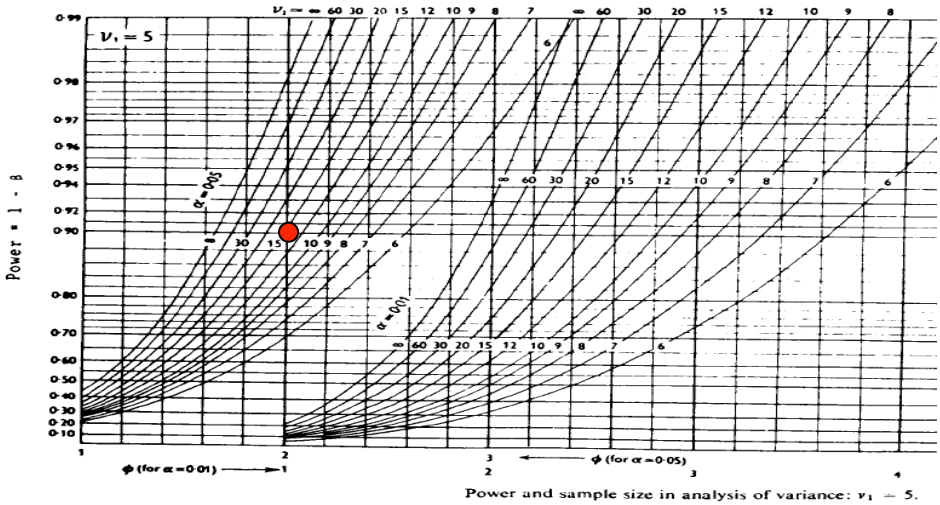
Treatment	Block 1	Block 2	Block 3	Block 4	Mean	τ_i^2
Seedling	34.4	35.9	36.0	34.1	35.100	0.188
Early bloom	33.3	31.9	34.9	37.1	34.300	1.521
Late bloom	34.4	34.0	34.5	33.1	34.000	2.351
Full bloom	36.8	36.6	37.0	36.4	36.700	1.361
Ripening	36.3	34.9	35.9	37.2	36.075	0.293
Control	36.4	37.3	37.7	36.7	37.025	2.225
Mean	35.267	35.100	36.000	35.767	35.533	$\Sigma = 7.940$
β_i^2	0.071	0.188	0.218	0.054	$\Sigma = 0.531$	

Source	df	SS	MS	F
Treatment	5	31.758	6.352	4.790
Block	3	3.187	1.062	0.801
Error	15	19.888	1.326	

To calculate the power of an RCBD, use Pearson and Hartley's power function charts (1953, Biometrika 38:112-130). To begin, calculate ϕ:

$$\phi = \sqrt{\frac{r}{MSE}\sum\frac{\tau_i^2}{t}} = \sqrt{\frac{4}{1.326}\left(\frac{7.940}{6}\right)} = 2.00$$

Looking in the power charts for $df_t = 5$, $df_e = 15$, and $\alpha = 0.05$, we find a power of ~ 90.5%.



Power and sample size in analysis of variance: $\nu_1 = 5$.