

Let's revisit Experimental Design!

Kanan Saikai

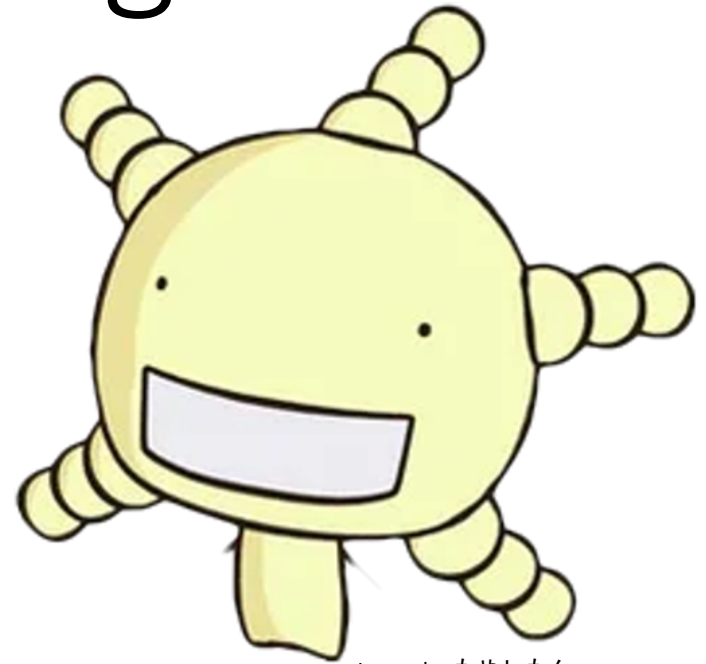
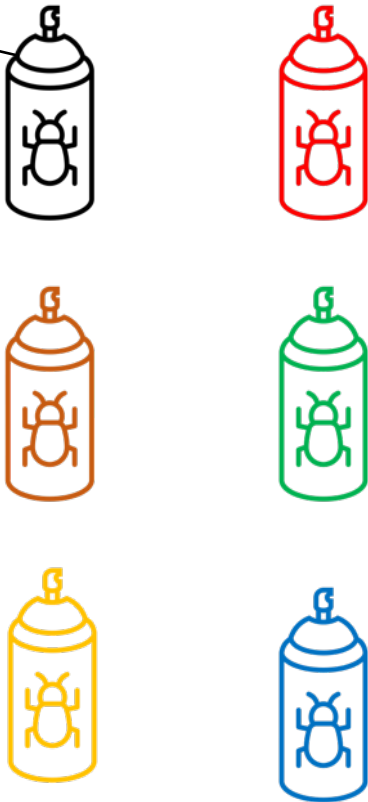


Image by もやしもん

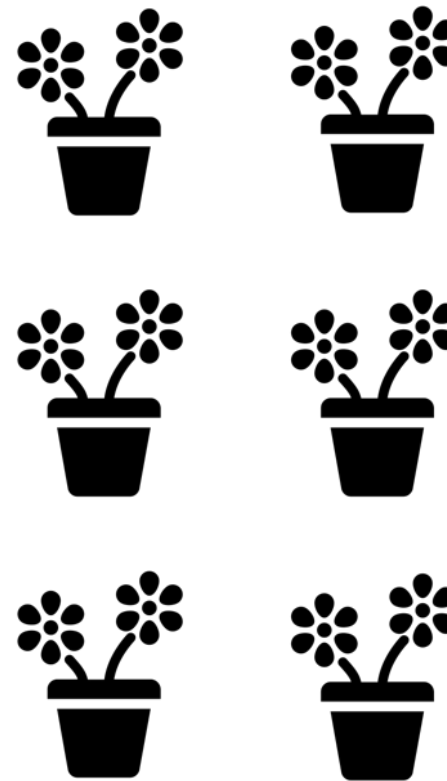
Don't get confused with...

“Randomization”

6 treatment

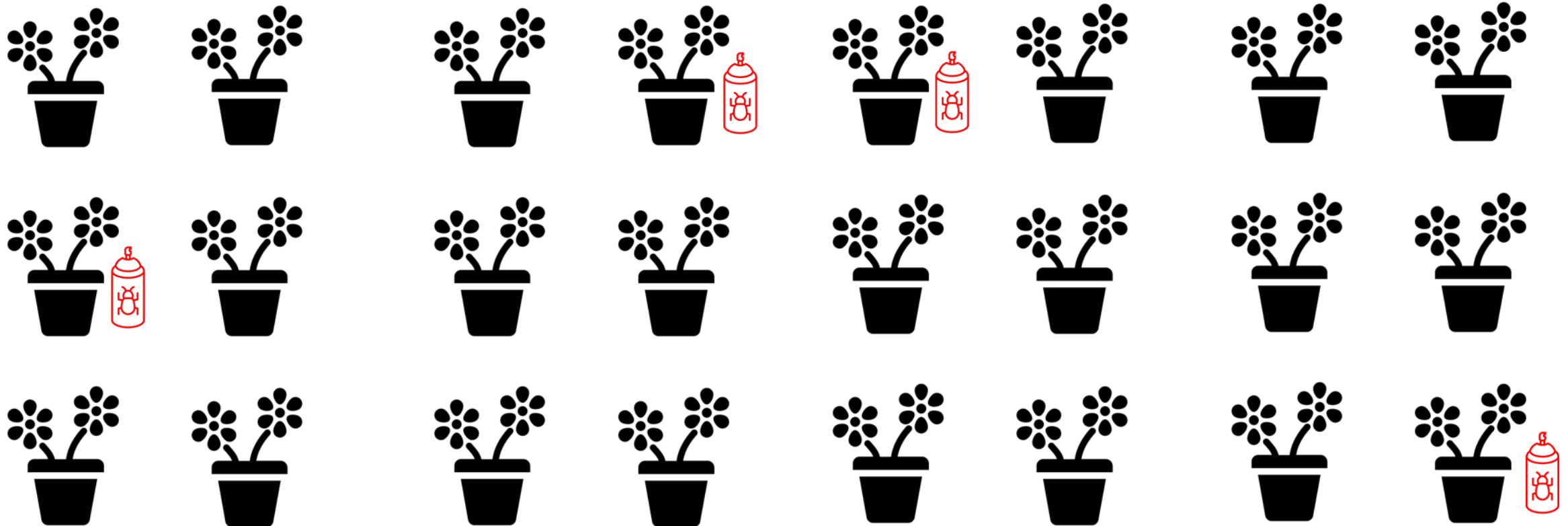


Experimental Unit



Don't get confused with...

“Replication” to obtain an estimate of error variation

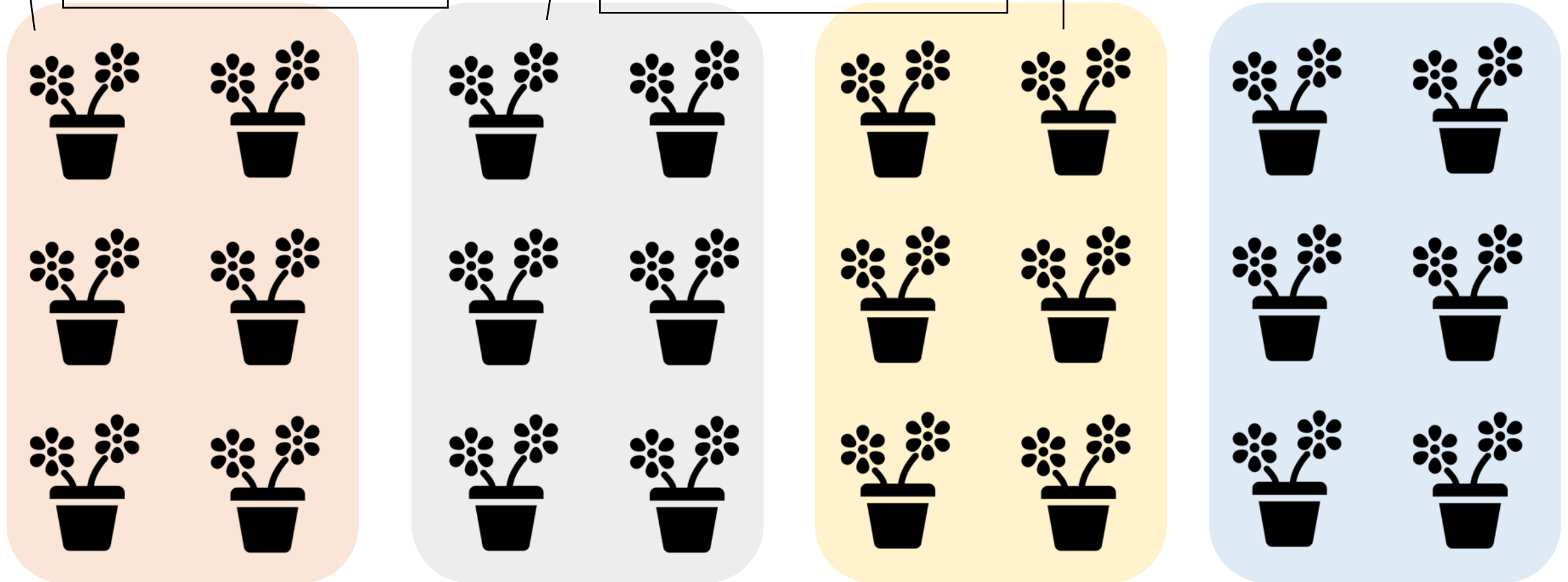


Don't get confused with...

“Blocking” = reduces unexpected error

Units within a block
are alike.

Units between blocks
are different.



Don't get confused with...

“Repetition” = increase precision and confidence.

Year 1

Site A



Year 2

Site A



Year 3

Site A



Site B



Site B



Site B



What is **Complete Randomized Design (CRD)**

Treatments = 6



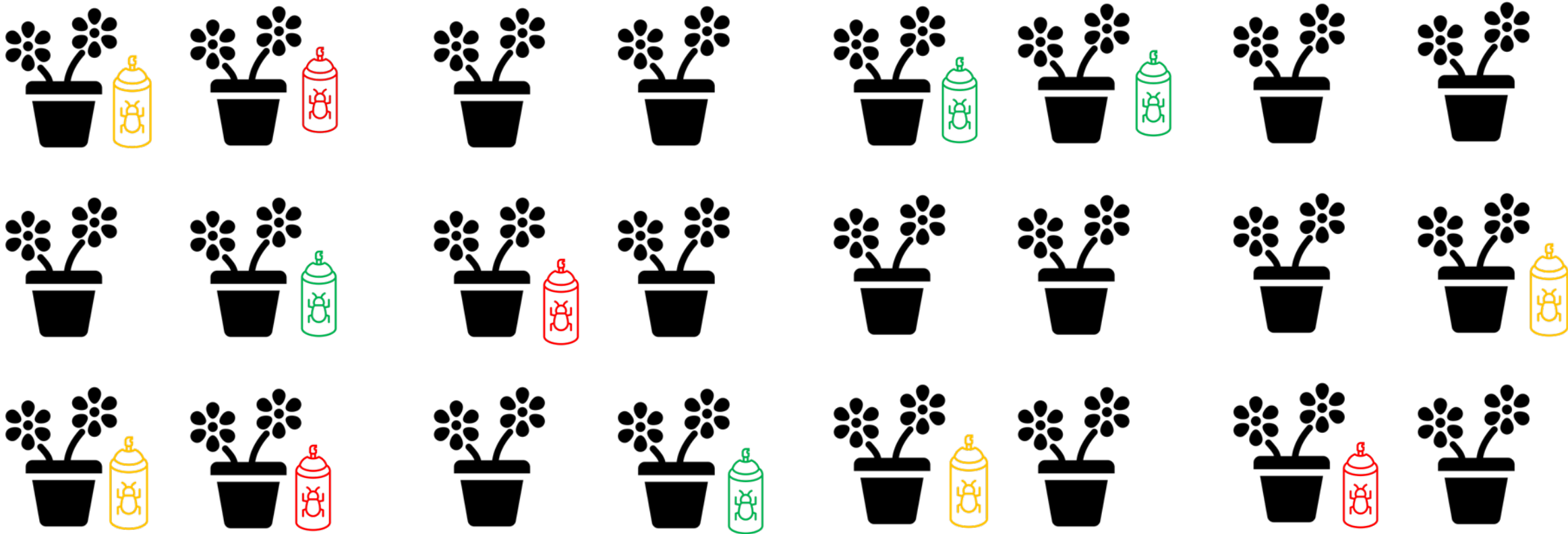
4 replications



24 EU

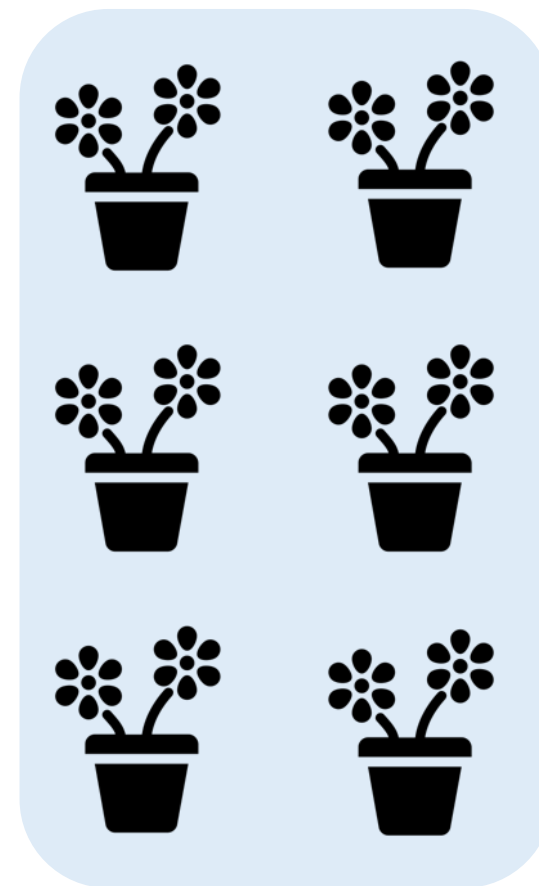
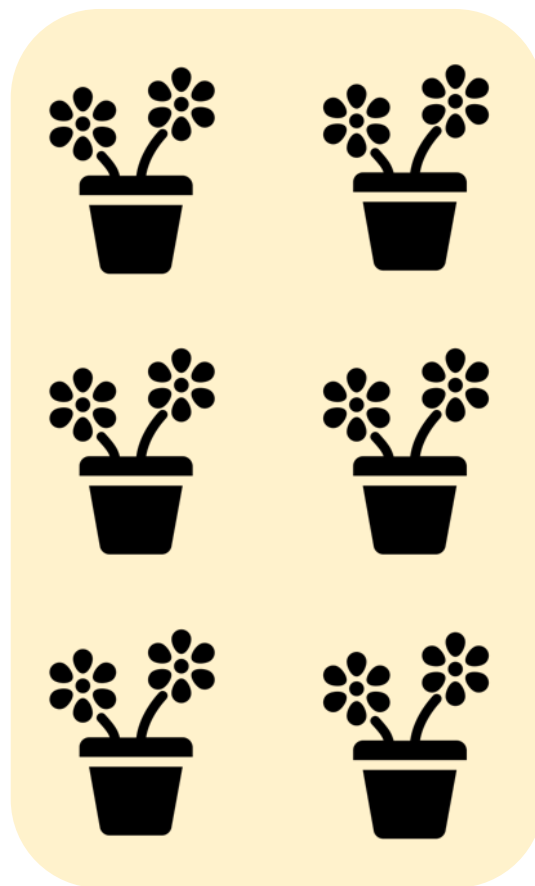
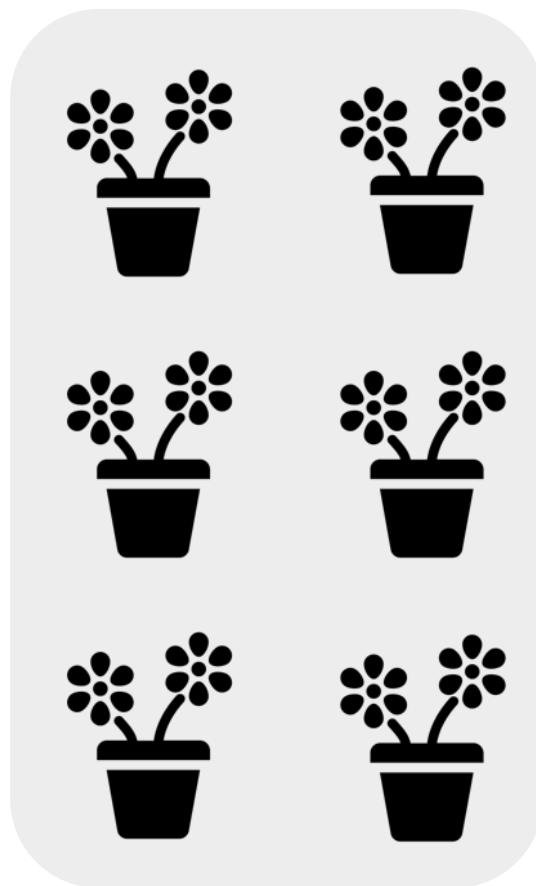
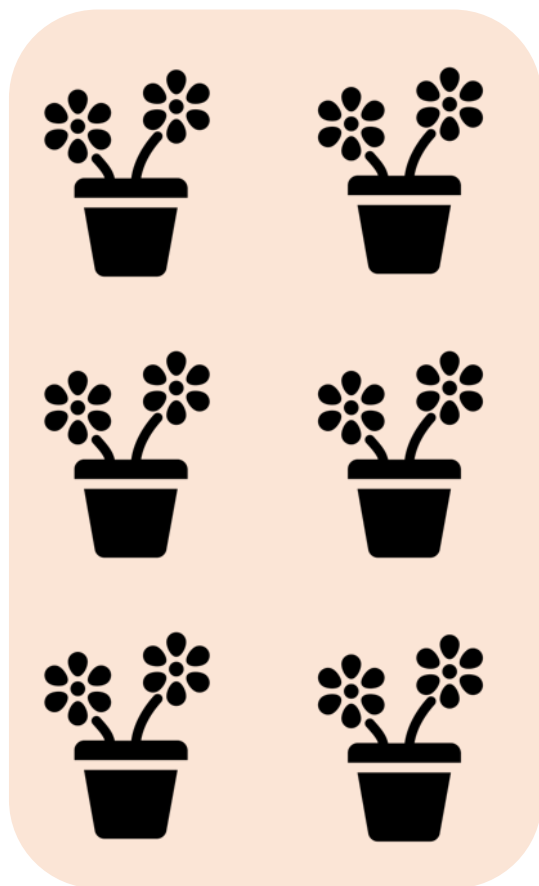


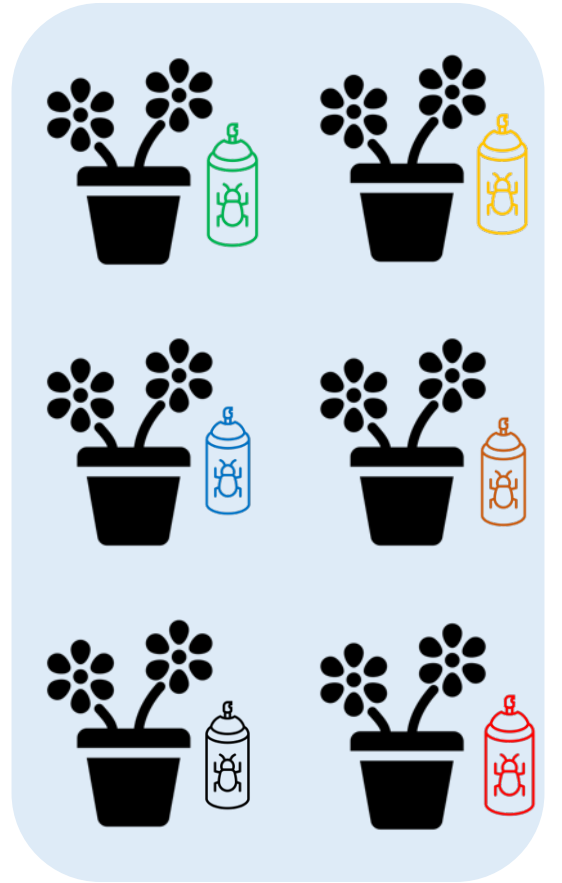
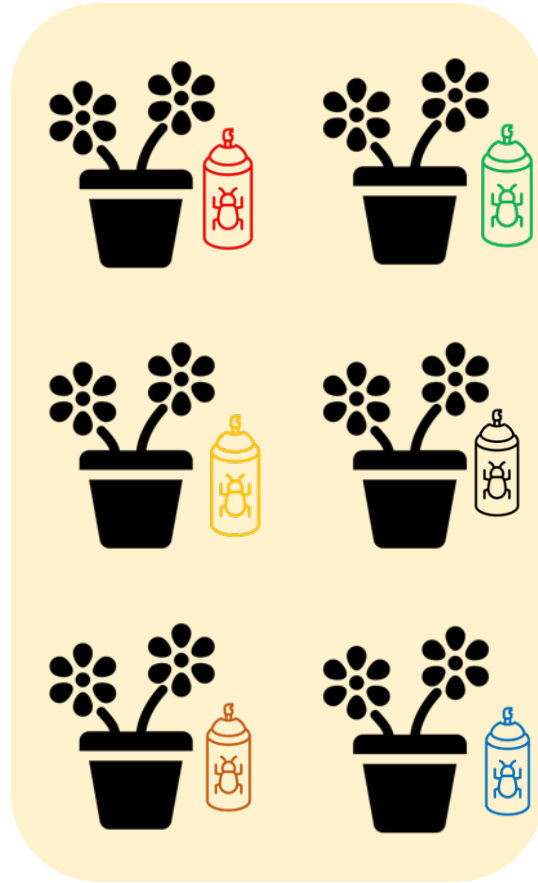
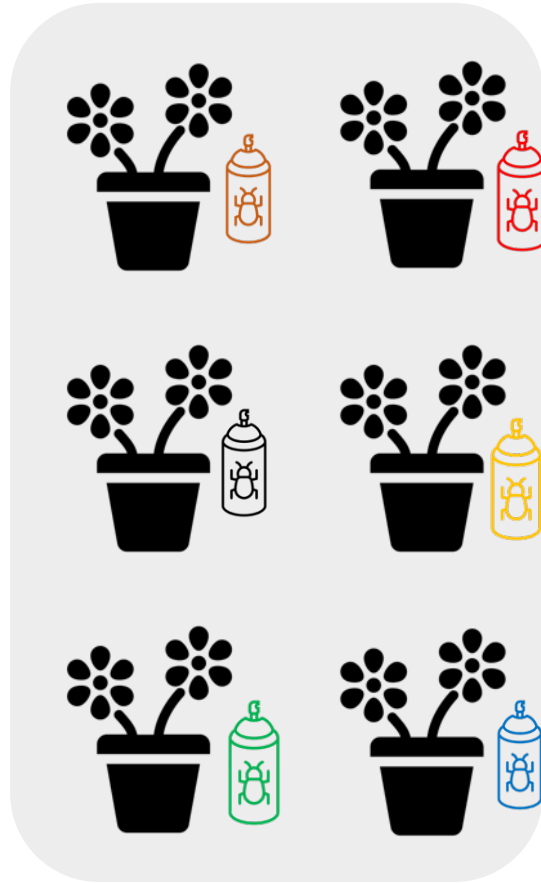
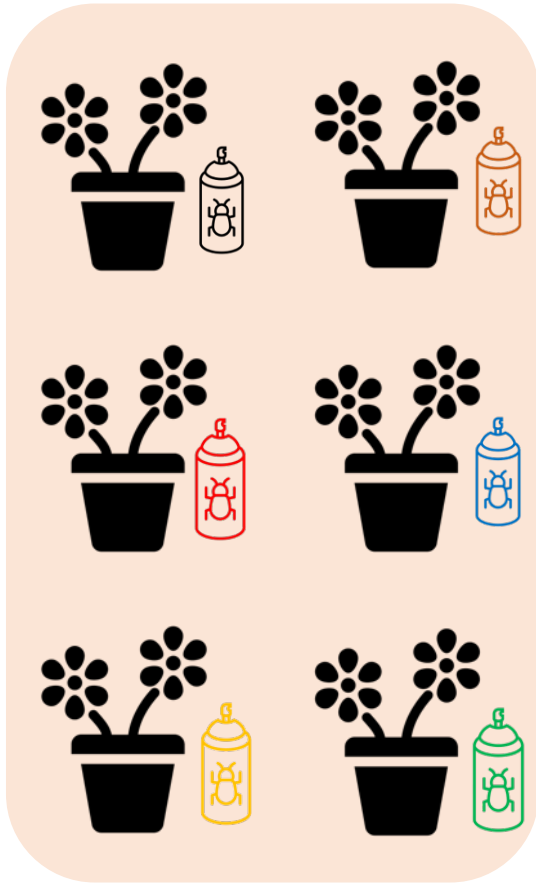
**Treatment assignment
ALL RANDOMIZED**





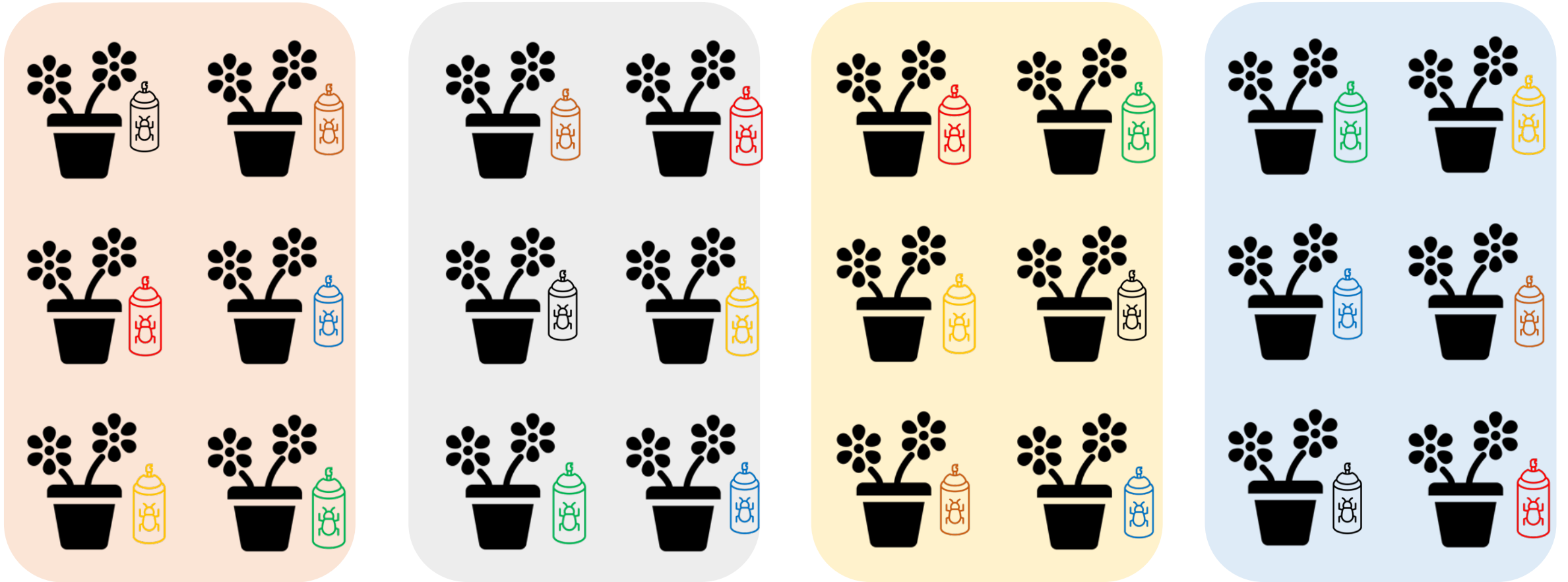
What is Randomized Complete Block Design (RCBD)





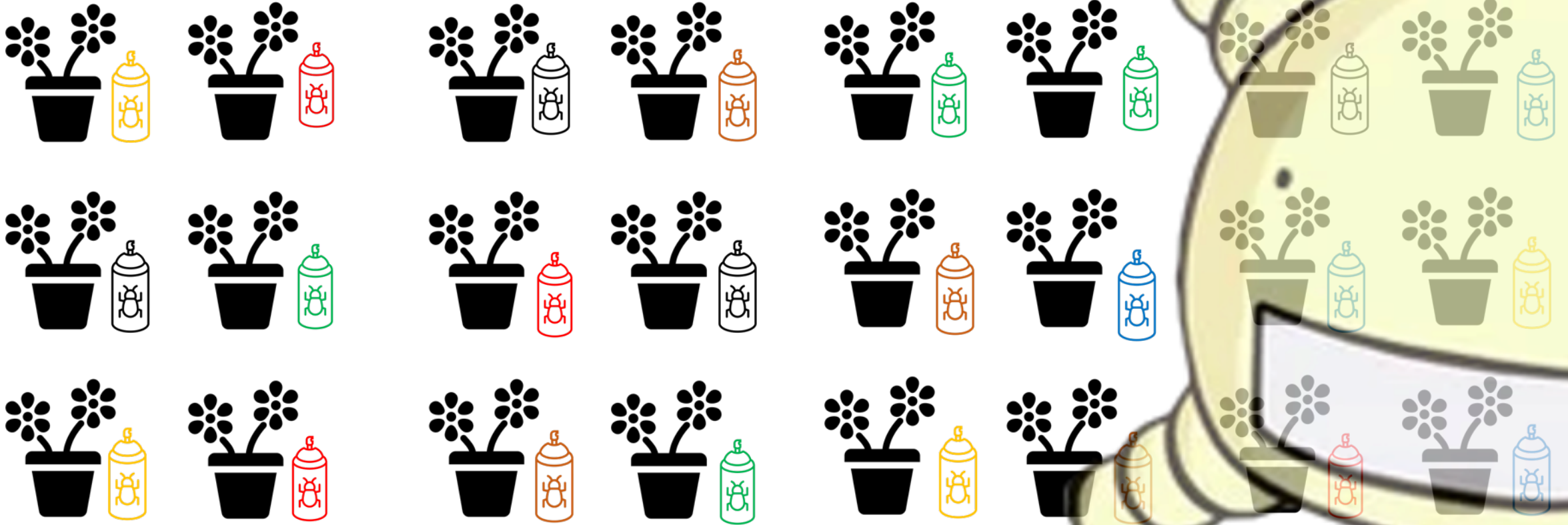
Units within a block
are alike.

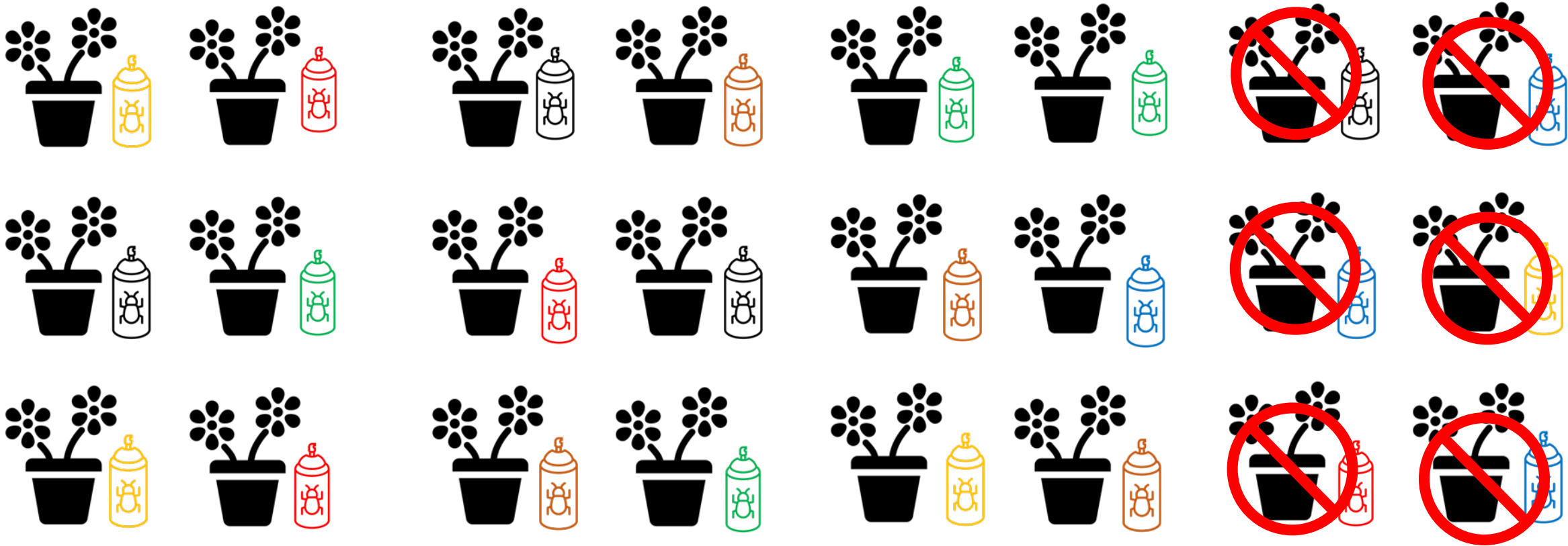
Units between blocks
are different.



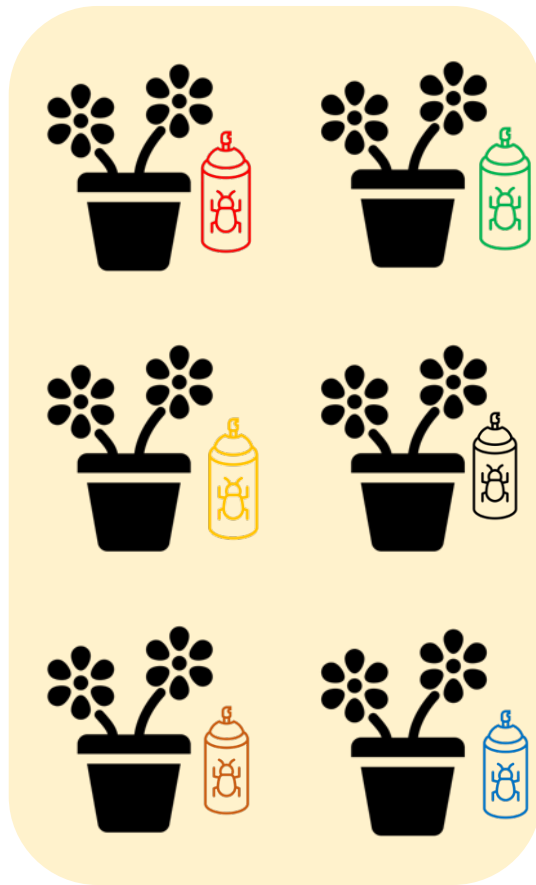
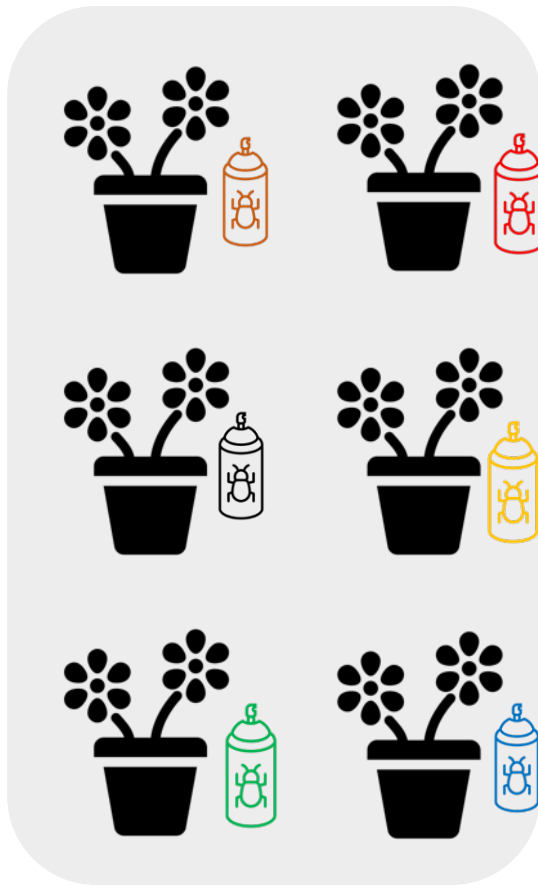
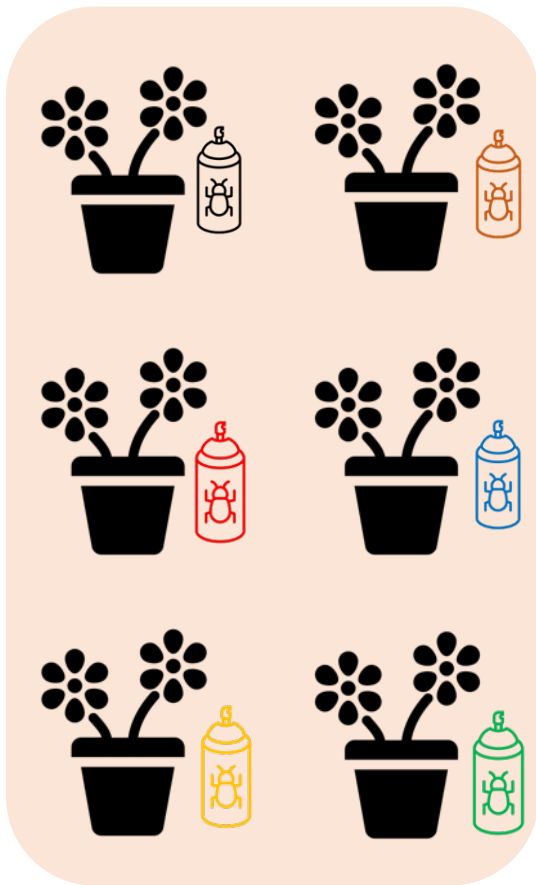
All treatments appear
once in a block

So why RCBD over CRD?

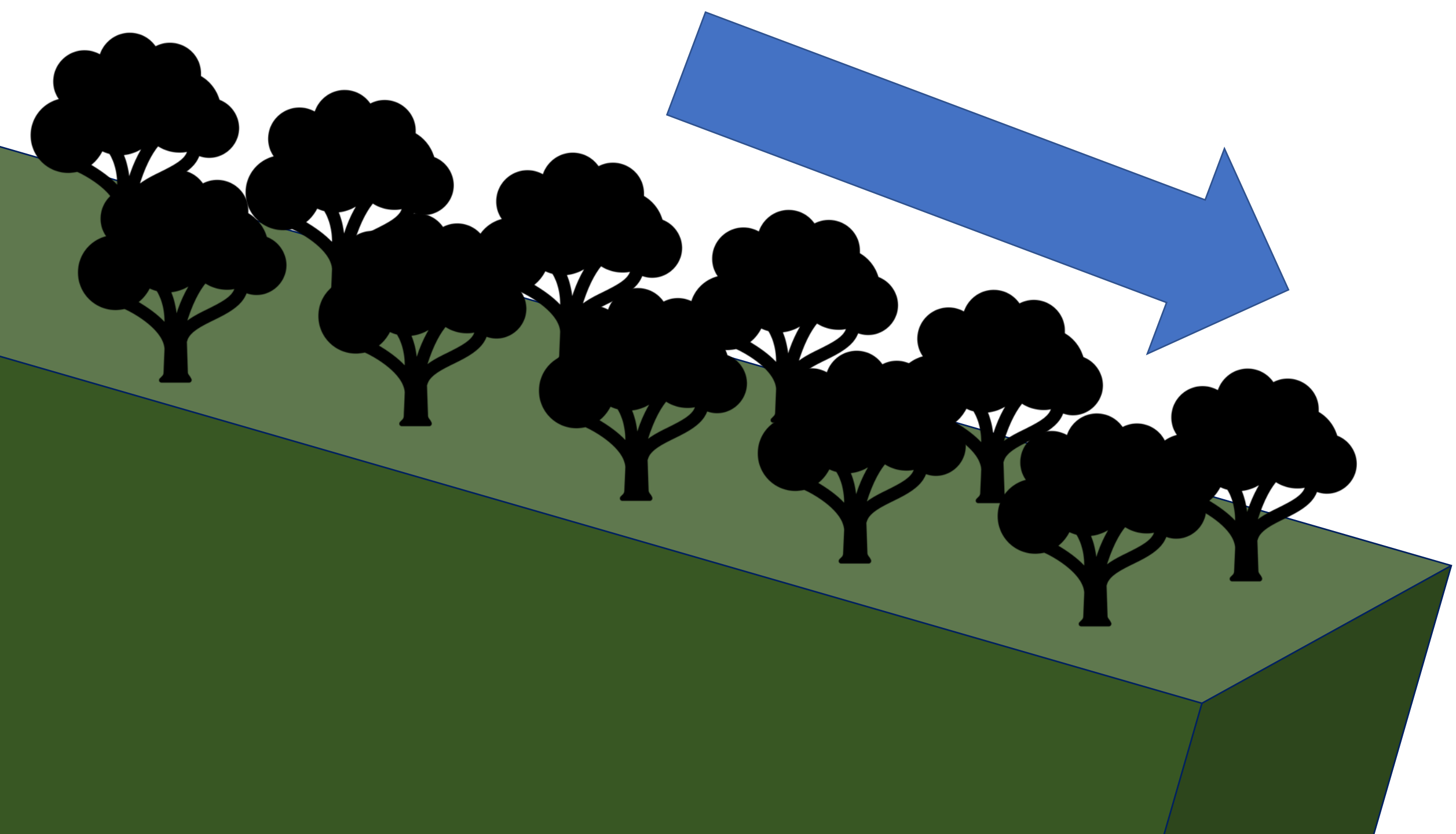


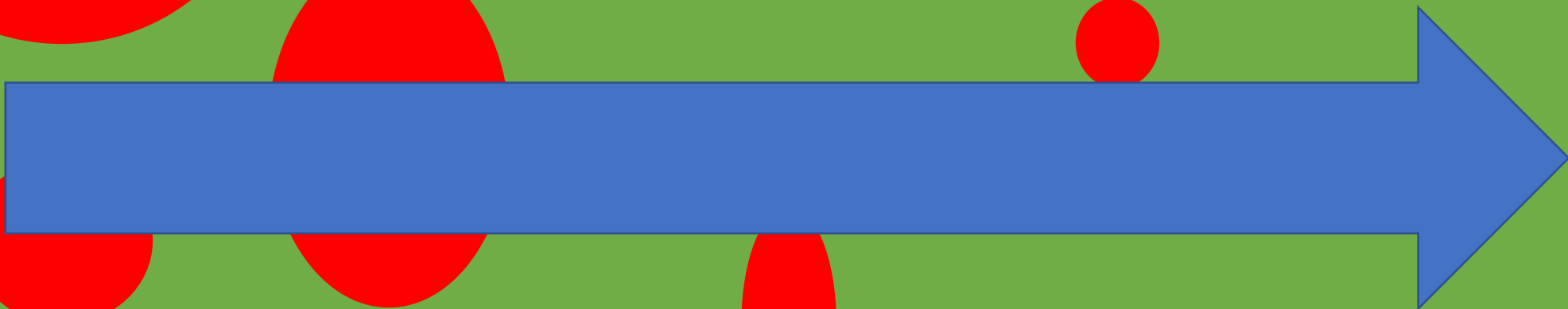
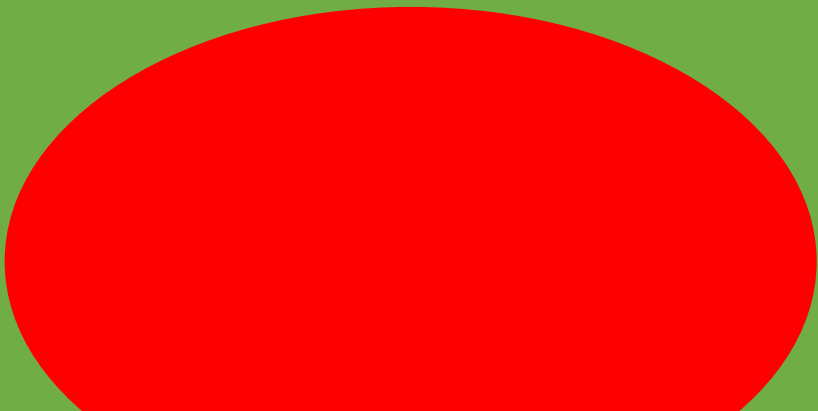
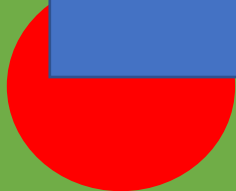
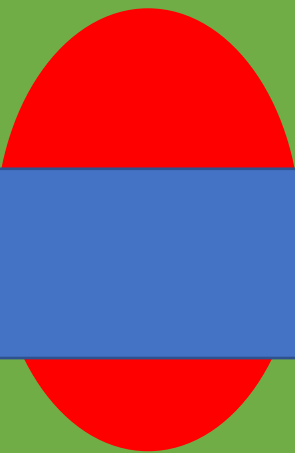


Door



Fan



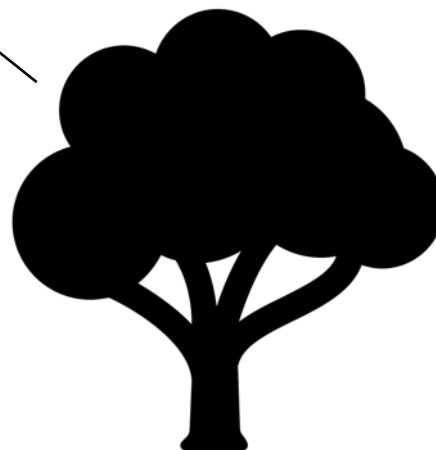


What is **Split-plot** Design

4 chemicals

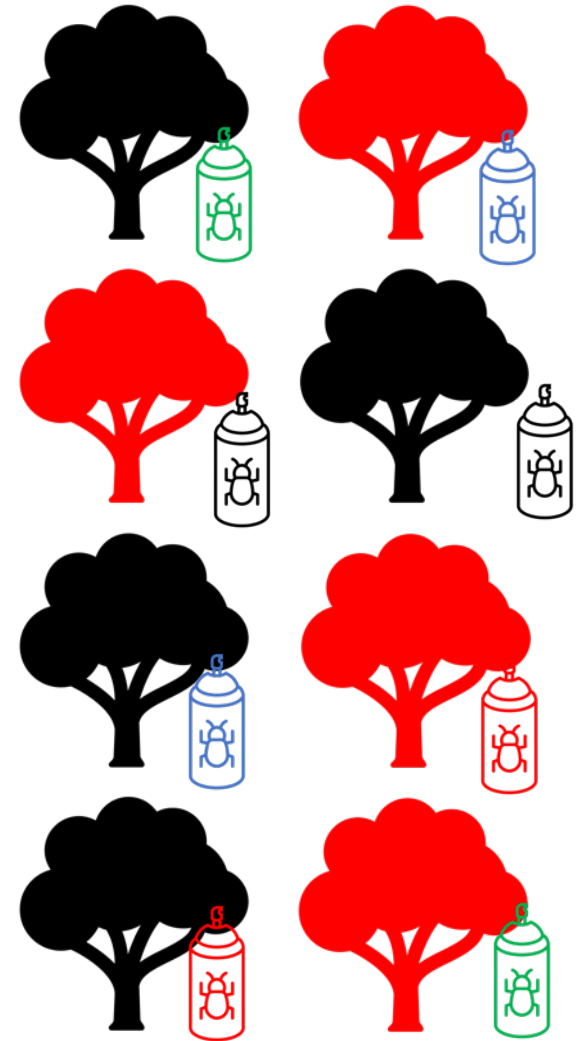
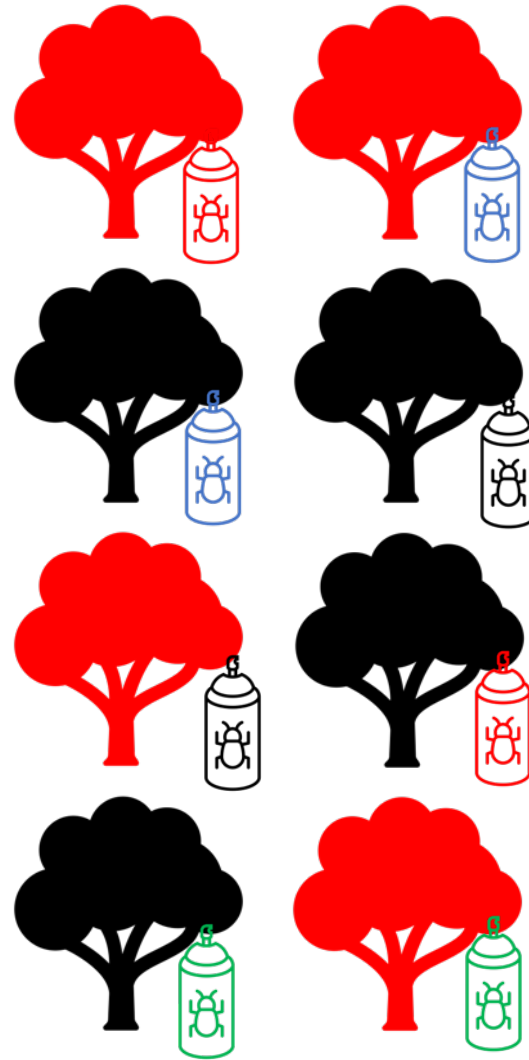
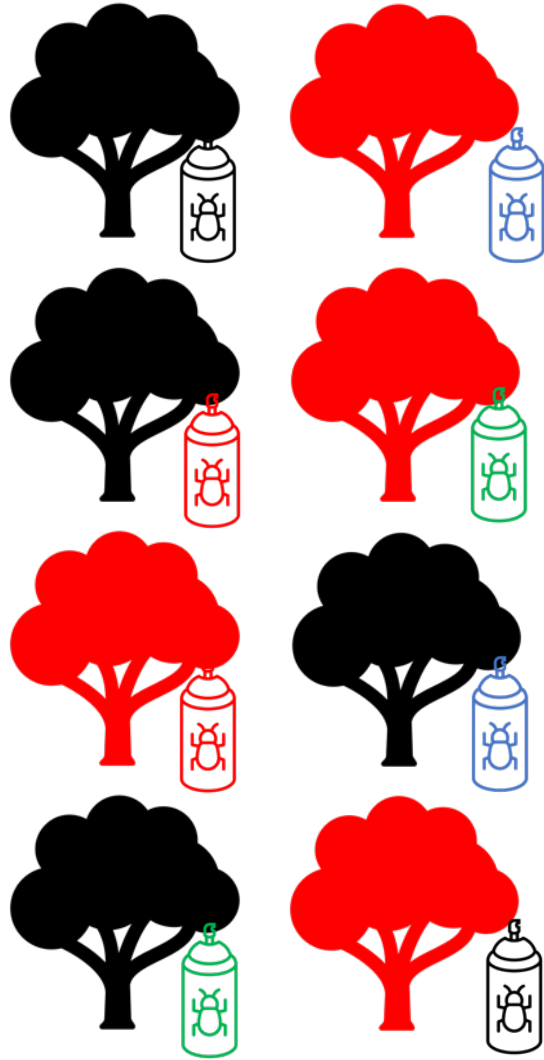


2 cultivars

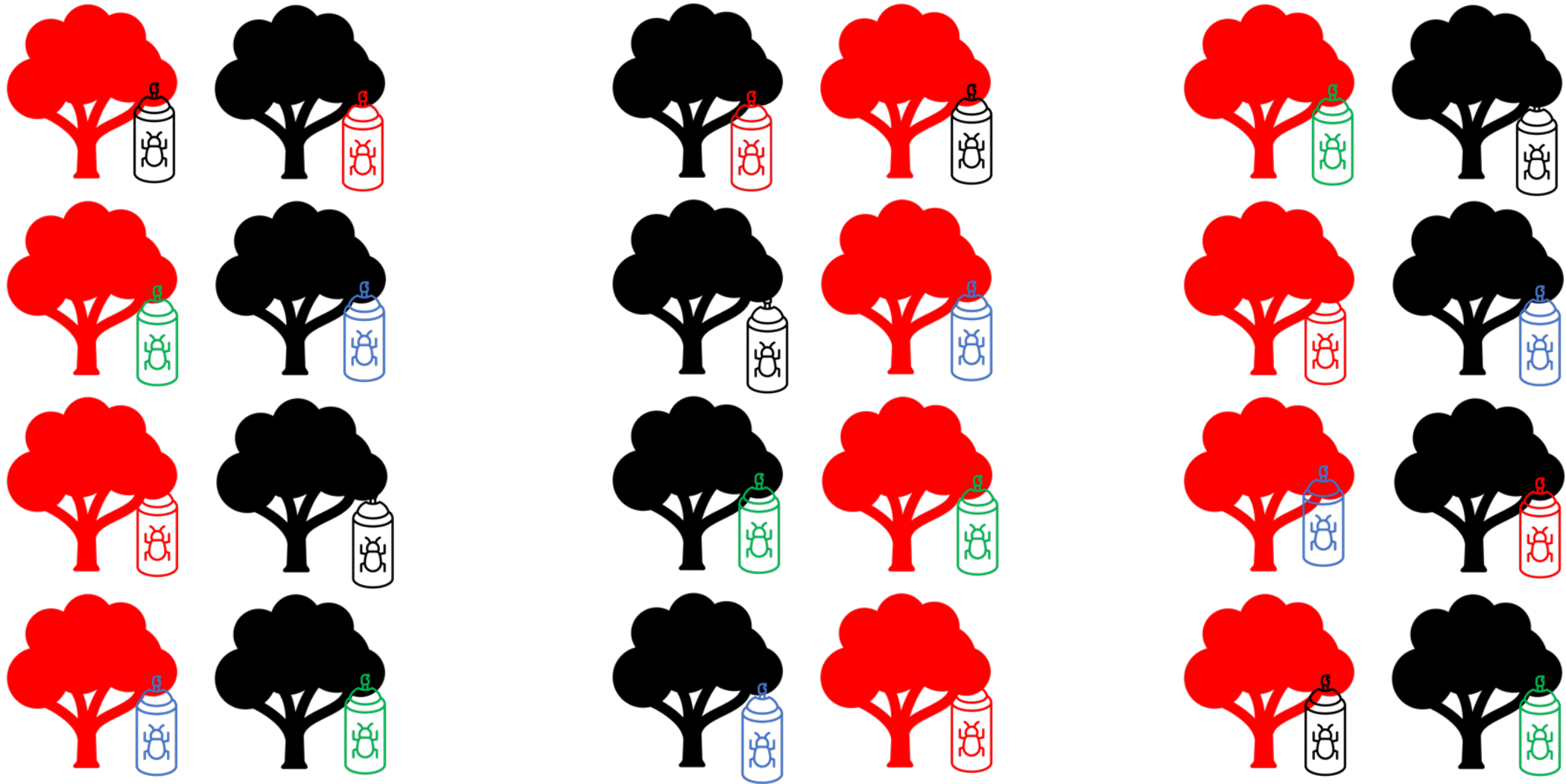


8 treat. comb.

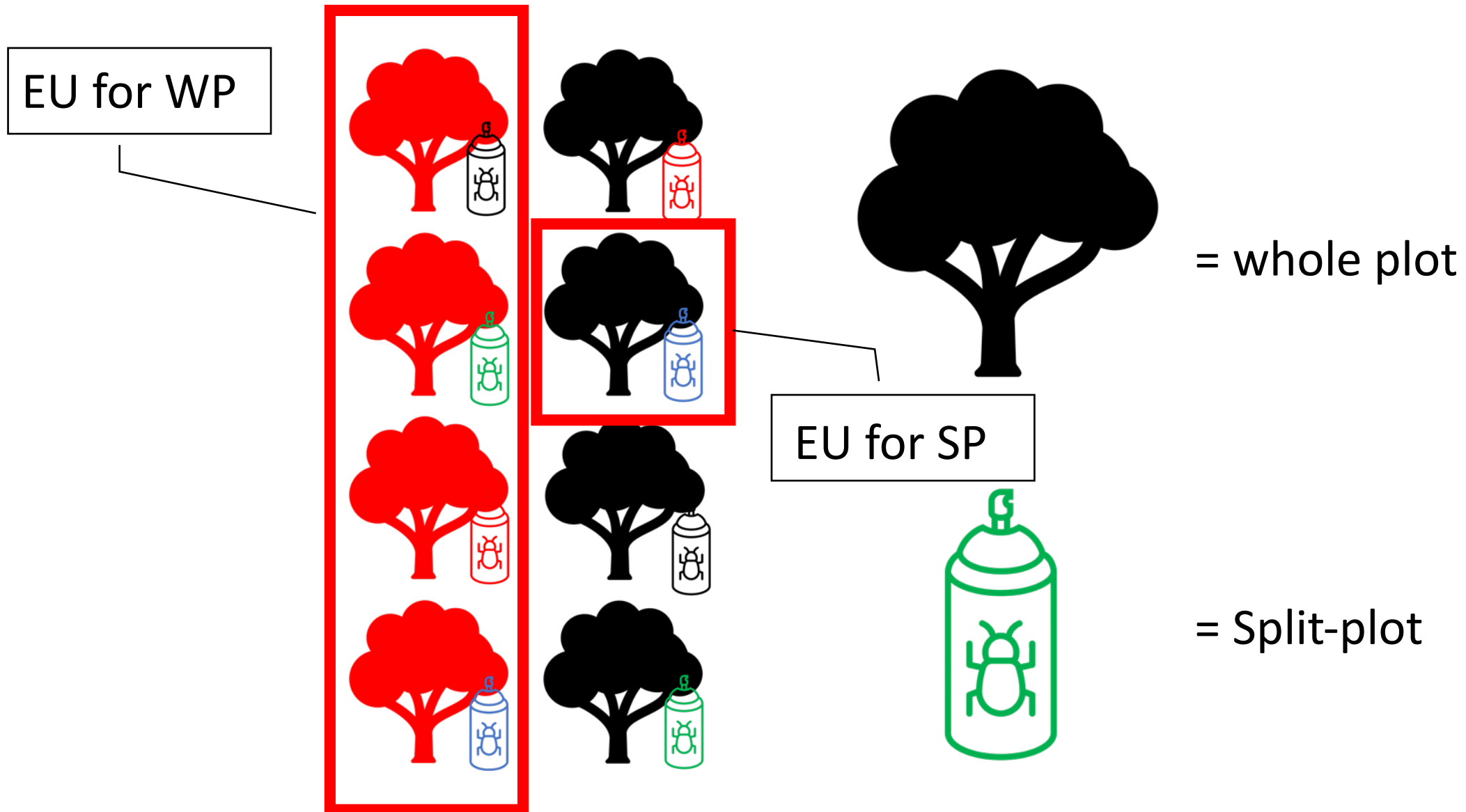
Idealy...



But reality is often this.



But reality is often this.



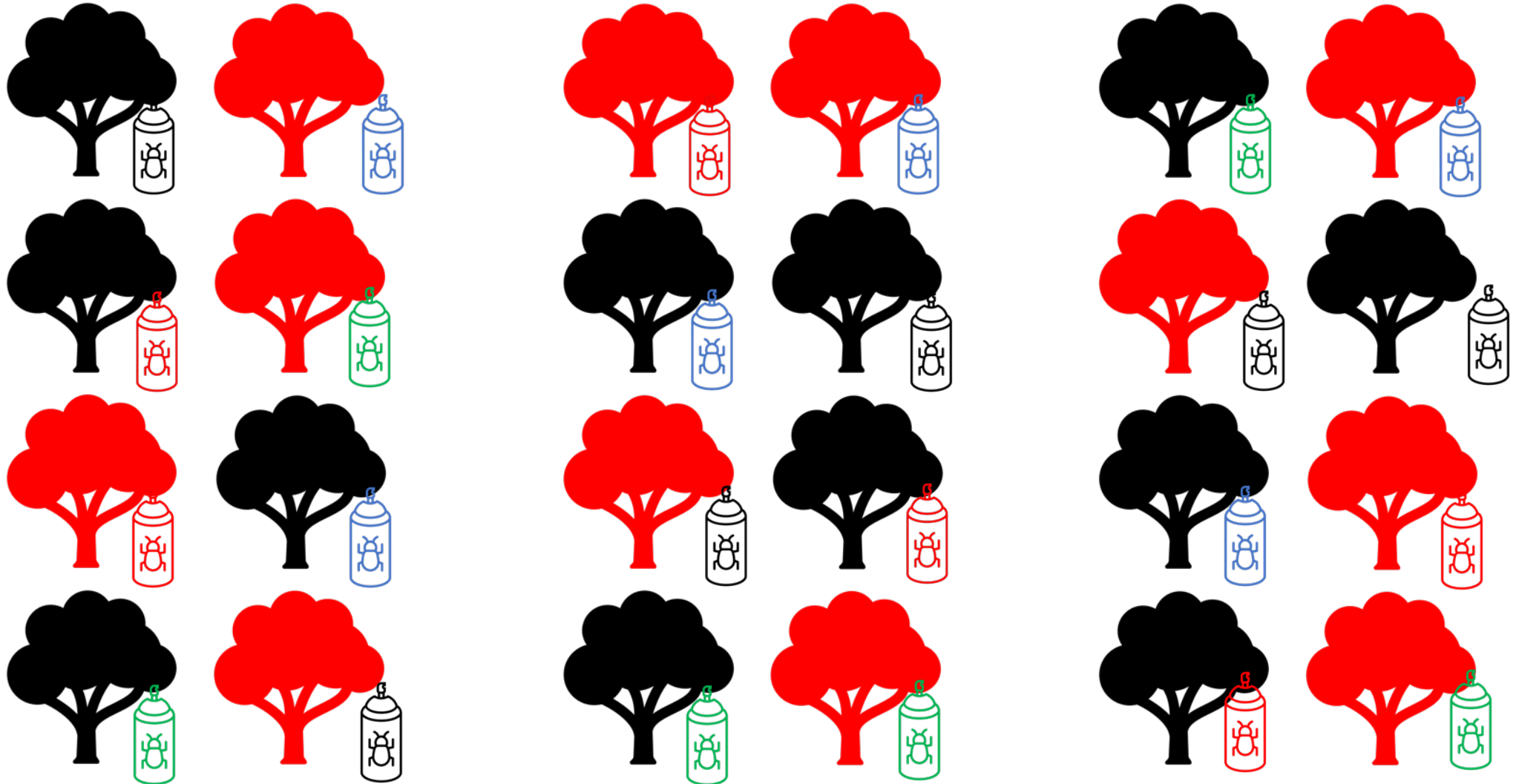
Split-plot design eases the implementation of trials.



RCBD vs. Split plot design

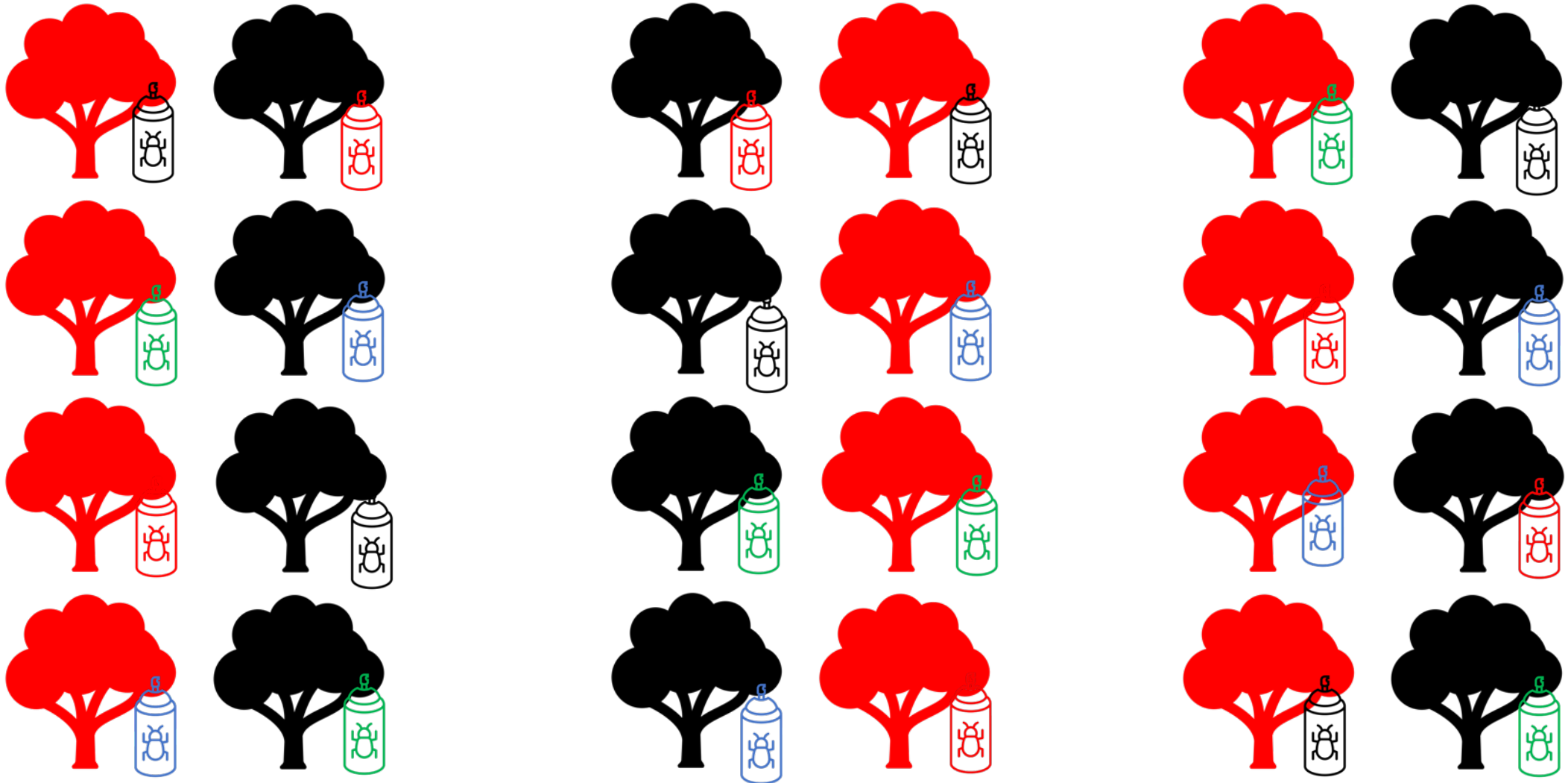
RCBD

$$Y = \mu + \text{Chemicals} + \text{Cultivar} + \text{Chem.*Cultiv.} + \text{Block} + \text{error}$$



Split plot design

$Y = \mu + \text{Cultivars} + \text{WP error} + \text{Block} + \text{Chemical} + \text{Chem.} * \text{Cultiv.} + \text{SP error}$



RCBD

Source of Variation	DF	Actual DF
Block (Rep)	$b-1$	$3-1=2$
Cultivar	$c-1$	$2-1=1$
Chemical	$f-1$	$4-1=3$
Cultivar x Chemical	$(c-1)(f-1)$	$1*3 = 3$
Error	$(b-1)[(c-1)+(f-1)+(c-1)(f-1)]$	$2*(1+3+3) = 14$
Total		23

Split plot design

More difficult to find difference
in the whole-plot.
Less affected in the Sub-plot.

Source of Variation	DF	
Block (Rep)	$b-1$	$3-1=2$
Cultivar	$c-1$	$2-1=1$
WP Error	$(b-1)(c-1)$	$2*1 = 2$
Chemical	$f-1$	$4-1=3$
Cultivar x Chemical	$(c-1)(f-1)$	$1*3 = 3$
SP Error	$(b-1)[(f-1)+(c-1)(f-1)]$	$2*(3+3) = 12$
Total		23

Designing is everything.

A wrong design can ruin any otherwise good experiments.

Let's spend more time to think about your experimental design before you start your trials.



**Announcement: the NemAfrica website is launched,
and need your help for contents!**

[Click here!](#)