

Activity: Randomization Distribution

A new fertilizer (RapidGro) has been developed that claims to increase the average tomato crop yield over that of an existing fertilizer (BetterPlant). To test this claim, a randomized experiment is designed in which tomatoes are planted in 11 plots. The new fertilizer (R) is applied to 5 randomly chosen plots and old fertilizer (B) is applied to 6 randomly chosen plots. Upon harvesting, the yield of each plot is measured (in lbs.) and the average yield for the plots treated with the new fertilizer is compared to the average yield of those treated with the old fertilizer.

What Did We Observe?

Plot	1	2	3	4	5	6
Fertilizer	R	R	B	B	R	B
Yield (lbs)	29.9	11.4	26.6	23.7	25.3	28.5
Plot	7	8	9	10	11	
Fertilizer	B	B	R	R	B	
Yield (lbs)	14.2	17.9	16.5	21.1	24.3	

Calculate the average yield of the plots treated with **Better Plant**: _____

Calculate the average yield of the plots treated with **RapidGro**: _____

Calculate the difference in the average yields: **Difference**: _____

Do these data suggest BetterPlant is more effective than RapidGro? Explain.

What If?

Suppose NEITHER fertilizer was more effective than the other. That is, suppose Plot 2 would have produced 11.4 lbs. of tomatoes no matter which fertilizer was applied. Likewise, Plot 4 would have produced 23.7 lbs. of tomatoes, regardless of fertilizer.

How many possible random assignments exist for this situation?

What Would We Observe?

What would we observe if we repeated the random assignment of fertilizers to the 11 plots?

Using the provided “Experimental Plots”, design a simulation to determine the distribution of yield differences when the fertilizers are equally effective. Perform 5-10 repetitions of the simulation and note the observed yield differences on a class dotplot. Repeat as necessary until the class has 100 observed differences calculated and plotted.

Simulation	1	2	3	4	5	6	7	8	9	10
B average yield										
R average yield										
Difference (B-R)										

Sketch and describe the class distribution of observed differences below.

How Likely Was What We Observed?

How many observed differences are greater than 1.69?

Assuming there is no difference in the effectiveness of the two fertilizers, what is the estimated probability of observing a difference at least as extreme as 1.69?

Is the originally observed difference (1.69) convincing evidence that RapidGro is more effective than BetterPlant? Explain.

Plot 1

Yield: 29.9 lbs

Plot 2

Yield: 11.4 lbs

Plot 3

Yield: 26.6 lbs

Plot 4

Yield: 23.7 lbs

Plot 5

Yield: 25.3 lbs

Plot 6

Yield: 28.5 lbs

Plot 7

Yield: 14.2 lbs

Plot 8

Yield: 17.9 lbs

