ecceducation



Sustainable forests – student experiment Releasing trees from competition

Aim:

To determine how competition between plants affects growth of individual plants and total stand growth

Hypothesis:

• How do you think increased competition will affect individual plant growth?

Variables:

- Controlled variables:
 - a amount of nutrients will be controlled by using the same amount of soil
 - $\ensuremath{\mathtt{x}}$ amount of water will be controlled by ensuring each 'stand' gets the same
 - p amount of light entering from above will be the same for each 'stand'

• Independent variable:

a amount of competition will be changed by planting seeds at different densities (spacings)

- Dependent variables:
 - p height of individual plants will be measured using a ruler
 - ¤ health of individual plants will be observed and recorded
 - ¤ total amount of growth will be measured at the end of the experiment by harvesting and weighing each stand

Equipment:

- 42 bean seeds (or other suitable fast growing plants)
- 6 small plant pots of the same size
- enough soil or potting mix to fill the pots
- ruler
- scales

ecceducation

Procedure:

- 1. Fill each pot to the same level with soil.
- 2. Plant seeds in holes two centimetres deep made with a pencil. (If you are using a different kind of seed, read the directions to obtain the correct planting depth.)
- 3. In two of the pots, plant a single seed and fill the hole with soil. Label these 'Pot 1' and 'Pot 2'.
- 4. In two more of the pots plant five seeds evenly spaced and fill the holes with soil. Label these 'Pot 3' and 'Pot 4'.
- 5. In the last two pots plant 15 seeds evenly spaced and fill the holes with soil. Label these 'Pot 5' and 'Pot 6'.
- 6. Water each pot just enough to moisten the soil, but ensure that each pot gets exactly the same amount of water.
- 7. Place the pots on a windowsill and ensure that all the pots are getting full light.
- 8. You should check your pots every two to three days to ensure they have enough water to keep the soil moist, but not wet. Do not overwater! Every pot should receive the same measured amount of water and this amount should be based on the needs of the wettest pot.
- 9. Every three to four days:
 - a) measure the height of each plant and calculate the average height of plants in each pot
 - b) observe any differences in the general appearance and vigour of the plants in each pot
 - c) record your measurements and observations in the results table.
- 10. At the conclusion of the experiment measure total stand growth. For each pot:
 - a) cut all the stems at soil level
 - b) weigh all the stems together
 - c) record the biomass (total mass of plant matter).

Alternative procedure:

Instead of planting different numbers of seeds in each pot, plant each pot out with 15 seeds. After a period of one to two weeks (depending on amount of growth), thin four of the pots to leave five plants. After the same period of time, again thin two of these pots to leave one plant.

Are there advantages to planting more seeds than required then thinning, rather than starting with seeds for the number of plants you eventually wish to end up with in each pot?

ecceducation

	r		-	·										·	r
Pot 6															
Pot 5															
Pot 4															
Pot 3															
Pot 2															
Pot 1															
Avg height (mm)	Observations														
Date	<u> </u>	4		*		*	<u> </u>	7	<u> </u>	7		7		*	

collection

Germination date:

Date planted:

Results: Seed type:_

Biomass:

	Pot 1	Pot 2	Pot 3	Pot 4	Pot 5	Pot 5
	(Low density)	(Low density)	(Medium density)	(Medium density)	(High density)	(High density)
Total mass of plants (g)						

- 1. Construct a bar graph showing average stem height in millimetres for each pot prior to harvesting.
- 2. Construct a bar graph showing biomass of each pot in grams after harvest.
- 3. Construct a line graph showing growth rates for each pot with number of days on the horizontal axis and average stem height in millimeters on the vertical axis.

Conclusions:

- 1. Which pots (low, medium or high density) had the greatest average stem height?
- 2. Which pots (low, medium or high density) had the greatest total growth (measured as biomass)?
- 3. From your line graphs, is there any indication of a point at which competition began to have an effect (i.e. growth rate began to slow down)?
- 4. Do the results of your experiment confirm your hypothesis?
- 5. What factors other than your controlled and independent variables may have affected your results?
- 6. If your bean seeds grew for 50 years, what projections could you make about the results then?
- 7. How could you improve the design of this experiment?
- 8. Can this experiment be directly compared to trees growing in a forest? What are some factors that may make a difference?

ecceducation