

How does fertiliser affect plant growth?

Farmers add fertiliser to the soil. Organic farmers use fertiliser made from animal waste. Non-organic farmers sometimes use this kind of fertiliser. They also use artificially produced fertiliser.

You are going to investigate how fertiliser affects the growth of radish plants.

Prediction

I think that adding more fertiliser to the radishes will ...

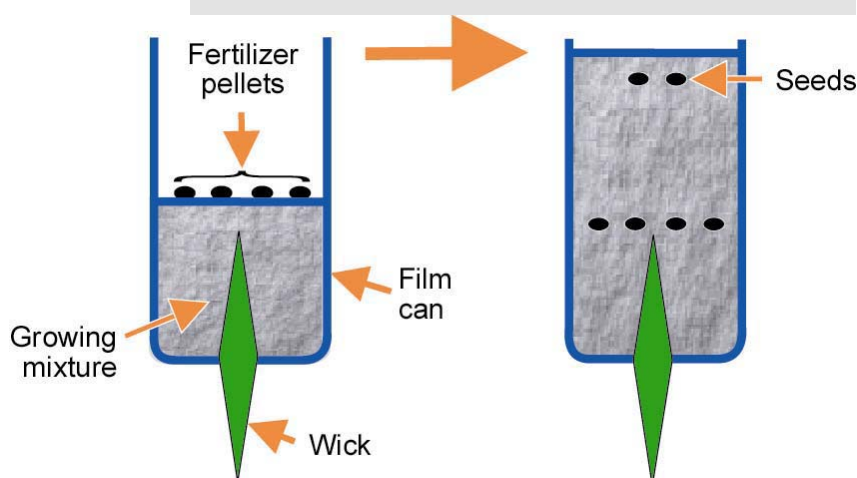
I think this because ...

Hints:

- Why do you think farmers add fertiliser to the soil?
- You may want to do some research about fertilisers before you begin.
- When you are ready, complete the prediction.

Plan

1. Set up five black film cans, like the one shown in the diagram.
2. Add a different number of fertiliser pellets to each can. Use 0, 3, 6, 9 and 12 fertiliser pellets.
3. Add more growing mixture. Place two seeds in the case, and lightly cover with growing mixture.
4. Write your initials, the date and the number of fertiliser pellets you have used on a label for each can. Stick the label into the side of the can.
5. Water the cans until it begins to drip out of the bottom.
6. Put the cans on matting that just dips into a reservoir, and is kept under lights.
7. After 4-5 days remove the least healthy seedling from each can, so there is only one.
8. After 2-3 weeks your radishes will be ready to harvest.
9. Take a radish from the film can. Using a scalpel carefully cut off the root and the shoot.
10. Wash the root in water to clean off all the growing mixture.
11. Collect all the roots from the no radishes with no fertiliser on a piece of filter paper. Collect all their shoots on a different piece of filter paper. Dry them in an oven between 90- 95°C for 24-48 hours. All the water should evaporate from the roots and shoots, leaving a constant dry mass.
12. Repeat this for the radishes with different amounts of fertiliser.
13. For each amount of fertiliser, calculate the average dry mass of a root and shoot.



Results

	Number of fertiliser pellets in film can				
	0	3	6	9	12
Average dry mass of roots (g)					
Average dry mass of shoots (g)					

Analysis

Draw a graph of your results. Remember that the variable you changed in your experiment should always go on the horizontal axis.

Use your results to help you answer these questions:

1. Was your original prediction correct?
2. Did different amounts of fertiliser pellets have the same affect on roots and shoots?
3. The fertiliser pellets contain nitrogen (N), phosphorus (P) and potassium (K). Find out what each of these elements is needed for in plant growth.
4. Find out what plants grown without one of these nutrients might look like. Do your plants grown without any fertiliser show any of these symptoms?
5. Farmers usually stop adding extra fertiliser when they have used a certain amount. Do your results suggest why they do not keep on adding more fertiliser?

Evaluation

1. Do you think your results are reliable enough to draw conclusions?
2. How could you make your results more reliable?
3. You measured dry mass in your experiment. Why does this make your results more reliable?
4. Were you sure that all the water had evaporated from your roots and shoots when you dried them? How could you be sure?
- 5* The growing mixture you used is very low in nutrients. Why was it used in this experiment? Can you suggest an even better way of growing the radishes?
- 6* Radish seeds have very little genetic variation between them. Why are they a good plant to use in an experiment like this?

Extension

What range of fertiliser pellets would you use if you repeated the experiment to find out the best number for maximum growth?

Why not try growing radishes with different types of fertiliser? You can buy organic and non-organic fertilisers from garden centres. Follow the instructions on the packets to decide how