Investigation into Cress Seeds

PLAN

Aim:

I will be investigating into the 'height' characteristic for each of the six cultivars of cress.

I have chosen height because I want to choose a characteristic with continuous variation. A characteristic with **dis**continuous variation will not provide any readable results, therefore with a continuous variation characteristic, I can compare the differences in variation more easily.

From this, I can also compare the **selective breeding.** Here is a diagram to explain what I mean by this:

SELECTIVE BREEDING

E.g. height of carrots

Height (mm)

Selective breeding is the crop which is only allowed to breed.

For example, Carrots wih highest lengths are required. To achieve this farmers have tried to overcome by this by controlling the two factors, which influence this characteristic, the environment and genes.

A plant may have inherited genes for tallness HH, but has not got enough of the three main elements needed to grow, water, minerals and sunlight from its environment.

Therefore, farmers first grow cress in ideal environments with sufficient light, water and minerals. Only the tallest crops are then **selected** to breed together. A new crop is grown. From that crop another batch and once again only the tallest crops are **selected** to grow.

If we were to look at the graph and see the height with the highest number this would be the selective breeding crop.

Hypothesis:

I know that the farmers of each brand of cress must have carried out artificial selection and tried to get as large an amount of selective breeding as possible.

According to my theory and scientific knowledge I have gained, I predict that the cress brands which have *not* had their genetics or environment controlled will have the *lowest* selective breeding. This would be the organic brand.

My reason for this is that this crop of cress would have been left to naturally breed. Homozygous dominant cress could have bred with a homozygous recessive therefore not producing the tallest offspring.

I think there would still be a selective breeding due to the NATURAL SELECTION of the environment. Each seed will have to *compete* for the three essentials for their survival value.

On the other hand, I predict the other brands will have a high selective breeding. This would be due to the human interference I had mentioned in my scientific knowledge. These could possibly be the 'extra curl'.

Farmers would get a certain selection from a crop of cress that may have the 'extra long curl' and only allowed them to breed. From that offspring another batch of selected crop with the same 'extra long curl' would be allowed to breed and so on and so on.

Fair Test:

In this experiment, it is essential that it is carried out in a fair way. To ensure this I will:

· Use the same no. of seeds in each petri dish. - Each cultivar will grow with the same competition as the others. Competition can effect the variation a great deal, as it could reduce growth.

· Spaced equally - If many seeds are close to each other their roots will find it harder to move as opposed to a seed with a lot of surrounding space. It is likely this seed will grow more, and therefore the results of variation will not be fair.

· Water them with same amount, daily. - To allow the cress to grow in a fair way I must give them a 'fair' environment.

· Place them in sunlight - For cress to grow they need sufficient sunlight for their photosynthesis process. Without the sunlight, there would be no growth.

· Clingfilm should be placed on bottom and top of tray. - This is to stop water escaping from the bottom.

Equipment:

1. 6 petri dishes

2. 25 X 6 seeds

3. tray

4. cling film

5. measuring tube

6. cotton wool

7. stickers

8. sello-tape

9. Scalpel

Method:

1. Collect all equipment

2. Place cotton wool (soil) in each petri dish but not too much otherwise it would be too dry.

3. Label each petri dish

4. Place seeds on top, equally spaced.

5. Water each petri dish with **10 mm** of water.

6. On the tray place cling film on base of tray

7. Place petri dishes in tray.

8. Place cling film again over the top, securing with tape to make environment airtight.

9. Every day remove cling film and water with 10mm of water. On Friday, water with 20mm of water.

10. Once they have grown, I will measure every cress in each petri dish. I will draw continuous variation graphs for each cultivar and compare the variations. I would have six results in total.

Safe Test:

To ensure a safe test I must

· Be careful NOT to drop the tray when taking it to the sink to be watered.

· '' '' when cutting roots with the scalpel.

OBTAINING EVIDENCE:

RESULTS TABLE

TYPE	GERMINATION NO.	HEIGHTS (mm)

Lepidium	**16**	**4, 5, 8, 8, 10, 10, 12, 12, 12, 13, 13, 13, 13, 15, 16, 19,**
Organic	**22 + 1**	**15, 15, 20, 30, 34, 34, 35, 35, 36, 37, 37, 37, 38, 38, 38, 40, 40, 42, 45, 45, 46, 51**
Thomson Morgan	**22 + 1**	**20, 26, 29, 30, 34, 34, 35, 38, 38, 40, 41, 41, 43, 45, 45, 45, 46, 46, 47, 50, 51, 52**
HurstCurled	**19**	**5, 5, 8, 10, 10, 10, 10, 11, 11, 12, 15, 15, 16, 18, 19, 20, 23, 30, 30,**
Mr. Fothergills	**23**	**16, 20, 23, 23, 24, 27, 30, 33, 33, 34, 35, 35, 37, 37, 37, 40, 40, 40, 40, 40, 40, 43, 45,**
Cress curled	**25**	**20, 22, 22, 23, 23, 25, 25, 25, 25, 30, 32, 33, 33, 33, 33, 35, 38, 38, 38, 40, 40, 40, 40, 40, 41,**

*** Numbers added on, are seeds that have germinated, but have not yet grown shoots.**

I have taken my results and placed them into a table for all six cultivars of cress. (See table).

I have also used the results of others to show evidence of secondary data. This has helped me to make my results more accurate.

As my necessary data had been collected, I produced graphs for all cultivars showing the variation. In addition to the six graphs, I produced a bar graph showing the average height for each cultivar.

ANALYSING EVIDENCE:

After analysing and comparing my graphs, my results show the cultivar with the **least** variation is the Lipidium.

This is shown by the bell shaped curve, which compared to all the other graphs is the 'flattest'.

As the curve is flat, it means that there is not a lot of variation because most of the seedlings are the same height as each other. This little variation shows there is not a big range in height between each of the cress of the Lipidium cultivar. Therefore, as all cress is of similar height it shows the **highest selective breeding**.

When this is compared to the averages Lipidium has 10 as its average and the 10-12 bars in the Lipidium graph is the highest of 22 seedlings. This shows that the Lipidium could have been selectively bred

On the other hand, the Sutton Organic, Mr. Fothergills, Sutton curled and Hurstcurled show a lot of variation. The Sutton Organic and Mr. Fothergills are both organic breeds. This could provide reasons why there is so much variation.

As I mentioned in my hypothesis, I expected the organic brands to have the **most variation** and **least selective breeding**. These seeds have come from cress that have been allowed to *breed naturally* in an *uncontrolled* environment. In addition, there are quite a few anomalies, which I have circled. In the 'Organic' brand, the cress height started from 15 to 51 (look at table), which shows a great range.

As for the 'curled' cultivars there could be various reasons for this.

1. As the 'curl' is the main necessity for these brands, 'height' may not be the important factor here.

2. After few days, I had changed the position of the tray so that the shoots, which had started to grow in one direction, would grow the opposite way. This would mean the cress would grow straight so that it would be easier for me to measure. However, this may have effected the growth at the auxin causing the wide range of results.

3. When we were measuring, we may not have all measured from the same place therefore ending up with high variable results.

I can see how variable the results are because when I compare the average height of the 'Hurst Curled' cultivar (17) to the graph the highest bar is the 9-12 mm bar.

Evaluating evidence

I think the experiment worked out relatively well, as I was able to draw conclusions from it. I was able to find the cultivars that had the highest and lowest variation and be able to relate this to my hypothesis. My aim was to investigate the selective breeding of each cultivar. This was achieved by comparing the bell shaped curves I drew on the graphs, which told me the amount of selective breeding.

Accuracy:

I think my results were quite accurate because I had incorporated a large amount of secondary data so there was less chance of being inaccurate. In case my results were incorrect, I could always use the other peoples results as we had all carried it out in the same conditions.

The average graph also provided extra data because I was able to compare the frequencies of cress to their average and see how close the two were.

I think that to improve the accuracy we all should have tried to pay more attention in the environment we were placing our seeds in. Below are some reasons.

Anomalies:

Though my results were quite reliable, I still ended up with few anomalies.

This could have been caused by the following reasons:

· Positioning of tray - some cress seeds may not be receiving the same amount of sunlight as the others so the rate of photosynthesis would have varied.

· Watering - We may have watered our cress at different times. N.B. For two days it was cloudy and therefore no watering was needed on those days. I did not water my cress but others may have.

· Positioning of seeds - We may not have all equally placed our seeds so competition may have affected this.

I have circled anomalies and noted what could have possibly caused this.

Improvements:

· I would take more care in preparation using the same size petri dishes and taking more care in placing the seeds. This would make the competition fair for each cultivar.

· I would place them in a much more controlled environment. All of them would be placed in similar areas where the would receive the same sunlight.

· I may use a larger data than just 25 seedlings per cultivar.

Further Improvements

· I could have carried out two lots of results if more equipment was available. This way I may not need to use other people's results.

· I could have investigated into another factor, which I could have provided more scientific reasons for. E.g. 'would cress grow better in cotton wool or sugar paper'.