



Lockdown Fieldwork: A biology practical that you can do in your garden or local park with no special equipment.

Daisy distribution

KS3 & 4 Biology and Maths

Holt Hall How many daisies grow in long grass compared with short grass?

Biology:

Daisy leaves grow into a 'rosette'. The growing part of the plant, where new cells are made by mitosis, stays close to the ground. This means that the plant can easily re-grow after being mown or grazed by a herbivore.

Aim:

To estimate how many daisies grow in frequently mown (short) grass compared with un-mown (long) grass.

Apparatus:

Quadrat - Make one by bending a metal coat hanger into a square shape. This is likely to give you a shape which is approximately $20 \times 20 \text{cm}^2 = 400 \text{cm}^2 = 0.04 \text{m}^2$

Quadrats are only useful for sampling plants or animals that don't move much.



Method:

We often want to find out how many plants are in a large area, such as a whole school field. It is not possible to count every plant so we sample the area and use our data to draw conclusions about the whole area.

We'll assume that during lockdown you only have a small area of grass that you have access to so we'll look at how to sample an area of short grass of one square metre. And an area of long grass of one square metre.

Measure a 1m^2 area of grass which has been mown frequently and the grass is short and a 1m^2 area of grass which is un-mown and the grass is longer. Ideally you could use two 1m rulers to define your sample area but if you don't have any you could use two pieces of string that are each one meter long. You could mark the string at 20cm intervals to help you to know where to put your coat hanger quadrat.

There are 25 places where you could lay a $20 \times 20 \text{cm}$ quadrat in a 1m^2 area. You need to place the quadrat randomly. Random means that every point in your sample area has an equal chance of being sampled. It's human nature to want to place your quadrat on top of a daisy plant but this is not good science- your data will be biased and you will probably overestimate the number of daisy plants.

To decide where to place the quadrat you could use random number tables to find coordinates or have a daisy lottery: number all 25 possible places, write the numbers 1 to 25 on little bits of paper, fold them up and put them in a pot, shake them up and draw out 5 numbers.

Place your quadrat 5 times within each of the sample areas. In each quadrat, count the number of daisy plants.

Compare the number of plants in the mown area with the number of plants in the un-mown area.

Daisy plants are easy to count but many plants are very difficult, for example it is not possible to count grass. In many studies, plants are sampled by deciding what percentage of a quadrat they cover.

Results:

Record your results in a table like the one below

Quadrat Number	Q1	Q2	Q3	Q4	Q5	Total	Mean
Mown Grass	2	5	10	8	6	31	6.2
Unmown Grass	2	1	0	0	3	6	1.2



Count each daisy plant, not each daisy flower. Count each rosette of leaves as one daisy plant. One daisy plant is circled in this photo.

Daisies in short grass

Data analysis

To estimate the total number of daisies in a study area, use this equation:

$$\text{Estimated number of daisies} = \frac{\text{mean number of daisies in one quadrat} \times \text{study area (m}^2\text{)}}{\text{area of quadrat (m}^2\text{)}}$$

$$\text{Study area} = 1\text{m}^2$$

$$\text{Area of coat hanger quadrat} = 20 \times 20 = 400\text{cm}^2 = 0.04\text{m}^2$$

In our results example:

$$\text{Mown grass: } 6.2 \times (1/0.04) = 155 \text{ daisy plants in } 1\text{m}^2$$

$$\text{Un-mown grass: } 1.2 \times (1/0.04) = 30 \text{ daisy plants in } 1\text{m}^2$$

If you know the area of the garden or park you could multiply your answer to estimate the number of daisy plants in the whole area!

The calculated total number of daisies is an estimate because if the quadrats were placed in different positions, the number sampled may have been different.



Conclusion

In this example there are more than five times more daisy plants growing in the frequently mown grass than in the un-mown grass.

Discussion

Daisies are well adapted to growing in grass that is mown frequently or grazed by animals. This is because the part of the plant where cell division takes place stays close to the ground. The growing point is able to avoid being damaged by the blades of a lawnmower or the teeth of a herbivore.

Daisies are not well adapted to growing in long grass. The long grass reduces the light that can reach the daisy leaves. If the grass stays long for a few months some of the daisy plants are likely to die



Daisies are not well adapted to growing in long grass. Their rosette leaves are easily overshadowed by taller grasses.

What questions do you have about this practical?

Here are a few:

- * When is it useful to use a quadrat?
- * What does random sampling mean?
- * Why is it a good idea to sample randomly?
- * Why is the answer an estimate?

