Modelling Population Growth

Introduction

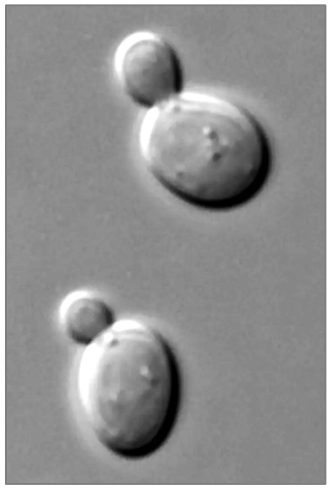
Stable populations in a fixed space will demonstrate a sigmoidal (S-shaped) population growth curve consisting of three main parts – an exponential growth phase, transitional phase and a plateau phase. Population growth curves can be modelled using simple organisms that grow in laboratory conditions – such as yeast or duckweed. These organisms are small and so can easily populate small containers that are easy to store, and their nutritional requirements are low, making experiments inexpensive to conduct. Also, these organisms reproduce very rapidly, allowing results to be generated in short time.

Aim

To record the cumulative population growth in a yeast solution over a defined period of time (3 days)

Method

1. In a 500ml beaker, dissolve a tablespoon of sugar in 300ml of water
2. Add half a teaspoon of yeast powder (~2.5g) and stir the solution
3. Using a pipette, remove one drop of the solution and place on a slide
4. Inspect the slide under a light microscope at 40× magnification
5. Count the number of cells and then move the view to another section
6. Perform two more counts to determine the average cell number
7. Cover the beaker with a petri dish to prevent contamination and store the beaker in a dark place where the temperature is stable (cupboard)
8. Repeat steps 3 – 7 at least five more times over the next three days (be sure to record the amount of time that has passed since set up)
9. If there are too many cells to count, the sample can be diluted via the addition of a drop of water (count must be doubled to include dilution)



EM: Yeast budding

Results (Data Table)

Recorded Time (hrs post setup)	0 hrs					
Measurement 1						
Measurement 2						
Measurement 3						
Average Count						

Results (Graph)

Use Excel to plot average cell count versus time (both linear and logarithmic). Include a sketch below:

Line Graph (normal axes)	**Logarithmic Graph**

***** To chart a logarithmic graph: right-click Y axis, select 'Format axis' and select 'Logarithmic scale'

Discussion

1. Explain the population growth over time and justify any anomalous or unexpected growth patterns

2. Predict, with a reason, the effect on the growth pattern if the sugar in the solution had been halved