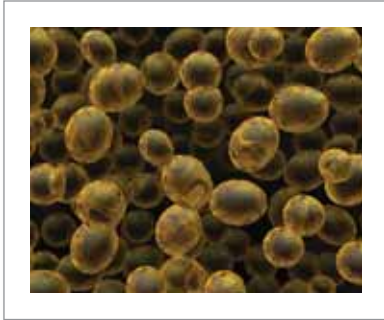


Comparing Exponential and Logistic Growth

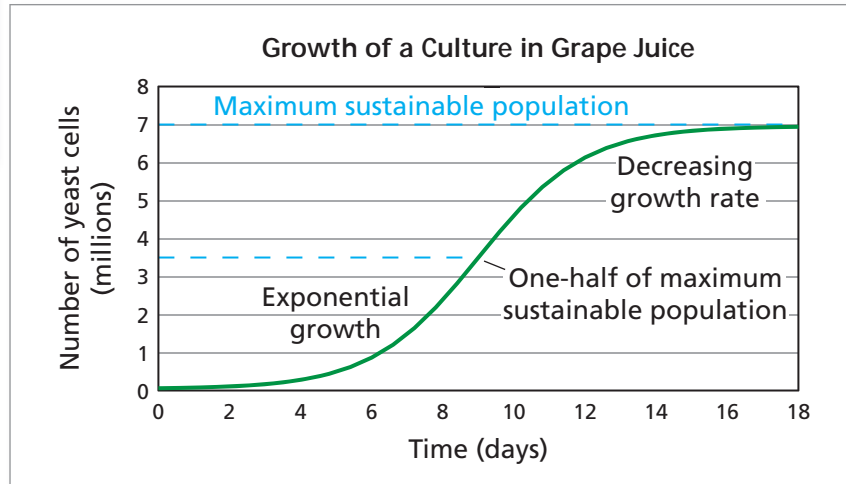
Exponential growth can only occur for a limited time in nature. Eventually, the quantity that is growing reaches physical boundaries. The resulting growth is called **logistic growth**.



Yeasts are single-celled organisms. Most reproduce by asexual budding (splitting to form two new yeast cells). When yeast cells lack oxygen, they die and produce alcohol. This process is called fermentation.

EXAMPLE 5 Comparing Exponential and Logistic Growth

The graph shows the growth of a culture of yeast cells that is introduced into a container of grape juice. Describe the growth.



SOLUTION

During the exponential growth stage, most of the energy of the yeast culture is devoted to reproducing itself. To do this, it uses the natural sugar that is in the grape juice. Wine fermentation has two stages called aerobic (with oxygen) and anaerobic (without oxygen) fermentations. After a few days in the first stage, most of the sugar and other nutrients in the grape juice are depleted. At this point, the oxygen source is removed and the growth rate of the yeast starts to decrease. Eventually, the yeast cells die (this is not shown in the graph). So, the population is limited by the food and oxygen available.

✓ Checkpoint

Help at Math.andYOU.com

What is your opinion about the sustainable population level of humans on Earth? Do you agree with Thomas Malthus, who predicted that the human population will grow exponentially, creating a permanent class of poor? Explain your reasoning.

- “1. Population is necessarily limited by the means of subsistence.
2. Population invariably increases where the means of subsistence increase, unless prevented by some very powerful and obvious checks.
3. These checks, and the checks which repress the superior, power of population, and keep its effects on a level with the means of subsistence, are all resolvable into moral restraint, vice and misery.” *Thomas Malthus*



Thomas Malthus is known for his theories on population growth. He claimed that populations are checked by famine, disease, and widespread mortality.