Name: ___________________________ Brady McDaniel ____

CASE

Activity 7.2.2 Biotic Potential

Purpose

Stranded on a deserted, barren island with no immediate hope of rescue, you have only enough food to make it through the first year. Floating in the wreckage of your boat off shore is a case of 100 “super” seedless mangos that will stay fresh forever. Another case floating nearby contains five “biotic” mangos that contain five seeds each. Each biotic mango seed will produce a tree reaching maturity in one year providing fruit. You can only save one case before they drift off too far from the island. Which case do you retrieve?

Plants produce any number of seeds in each individual fruit. The hope is that the fruit will be carried away or fall far enough from the plant to have some of the seeds be successful in becoming a new plant. Producing more than just one seed is the mechanism plants use to ensure the survival of its species.

What are the exponential effects of producing multiple seeds per parent plant? Examine two plants with very different approaches to the mathematics of sexual reproduction.

Materials

Per pair of students:

- Scalpels
- Paper plates
- Bean pod containing seeds
- Bell pepper
- Calculator

Per student:

- Pencil
- *Agriscience Notebook*

Procedure

In this activity, you will collect evidence to support an answer for the question posed in the purpose of this activity. You and your partner will complete the two parts of this activity and answer the questions at the conclusion.

Part One – Bean Dissection

Using the bean provided, complete the following dissection and calculations.

1. You and your partner will use the scalpel to carefully slice the bean pod in half along the length of the pod on the paper plate.
2. Remove all seeds from the pod and discard the flesh.
3. Count the number of seeds from your bean and record the data in Table 1 on the Student Worksheet.
4. Use the formula below to calculate the biotic potential of your bean for the next four years.

Formula: $Y = s^x$

5. Complete Table 1 for the biotic potential of your bean. For simplicity, assume that each seed produces one plant with one fruit containing the same number of seeds as the parent pod.
6. Graph the data in the space provided, on a sheet of graph paper, or using a computer spreadsheet. Start with year zero.

Part Two – Pepper Dissection

Using the pepper provided, complete the following dissection and calculations.

7. Use the scalpel to carefully slice the pepper in half on the paper plate.
8. Remove all seeds from the pepper and discard the flesh.
9. Count the number of seeds from your pepper and record the data in Table 2 on the Student Worksheet.
10. Calculate the biotic potential of your pepper for the next four years using the formula $Y = s^x$. For simplicity, assume that each seed produces one plant with one fruit containing the same number of seeds as the parent pod.
11. Complete Table 2 for the biotic potential of your pepper. For simplicity, assume that each seed produces one plant with one fruit containing the same number of seeds as the parent pod.
12. Graph the data in the space provided, on a sheet of graph paper, or using a computer spreadsheet. Start with year zero.
13. Clean up your workspace according to your teacher's directions.

Analysis Questions

1. Which plant has the greater biotic potential?

The pepper has the greater because of the amount of seeds that it starts with.

14. What are three noticeable anatomical differences between the bean and pepper seed structures?

The bean has a much smaller amount of seeds. Next the bean pod has seeds spread all throughout the plant and the pepper has them all at the top. Also the bean is green and the other is red.

15. Why do you suspect the pepper plant produces so many seeds in comparison to the bean plant?

It is a brighter color and more likely to be eaten because it stands out.

Conclusion

1. What are some threats or limiting factors that prevent all of the seeds from becoming new plants?

Weather or predators because it can alter or stop growth of new plants.

16. What would happen to the total number of plants in the fourth year if only half of the seeds survive after the first year?

The number would be much smaller because only half the amount of seeds will make more seeds so the graph will not be quite as steep.

17. In the scenario described in the purpose section above, which case do you go after and why? Support your answer with data. How does understanding biotic potential and exponential growth affect your choice of which option you should choose?

The biotic growth is an exponential graph because it is theoretically that all the plants will survive and in reality the only some will.

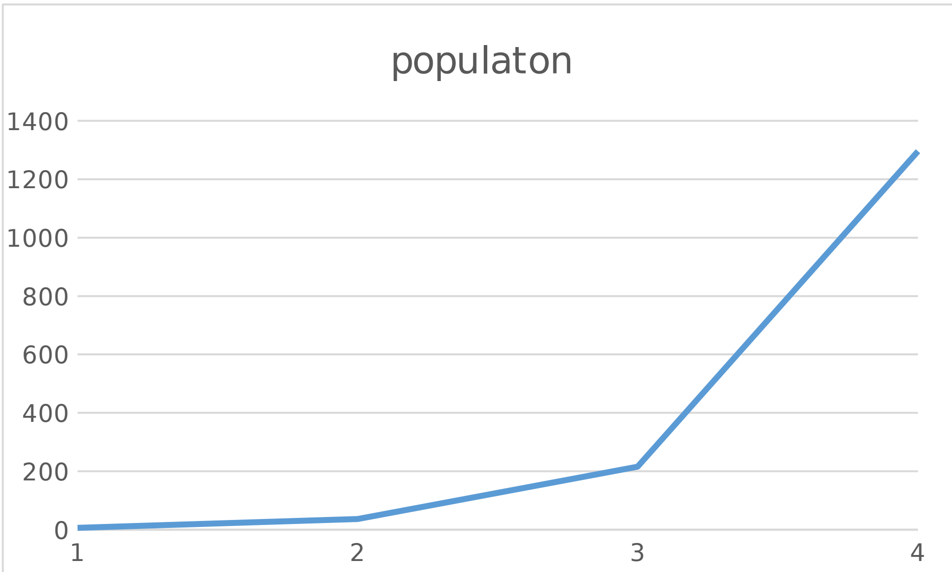
Name: ___________________________ Brady McDaniel ____

Activity 7.2.2 Student Worksheet

Table 1. ***Summary of Biotic Potential for the Bean***

Number of seeds recovered:		
X (number of years)	**Formula (Y=s^x)**	**Y (number of beans)**
1st year: Number of plants produced if every seed produces a new plant:	6	6
2nd year: Number of plants produced if every seed produces a new plant:	6x6	36
3rd year: Number of plants produced if every seed produces a new plant:	6x6x6	216
4th year: Number of plants produced if every seed produces a new plant:	6x6x6X6	1,296

Graph of bean population



Population

1 2 3 4

Year

Table 2. ***Summary of Biotic Potential for the Pepper***

Number of seeds recovered:		
X (number of years)	**Formula ($Y=s^x$)**	**Y (number of peppers)**
1st year: Number of plants produced if every seed produces a new plant:	35	35
2nd year: Number of plants produced if every seed produces a new plant:	35×35	1,225

3rd year: Number of plants produced if every seed produces a new plant:	35×35×35	42,875
4th year: Number of plants produced if every seed produces a new plant:	35×35×35×35	1500625

Graph of pepper population