Name: ____

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

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

Seed colors

The green bean seeds are more squishy,and the peppers seeds are harder

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

The pepper plant is a lot bigger

Conclusion

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

The seeds could be under or over watered

They temp could be too cold or hot

Some seeds may just be dead when you plant them

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? you would have as much as 3% of your seeds left no more though.

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?

I would choose the five “biotic” mangos because then I can keep growing mangos

Name: ____

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:	Y=10^1	10
2nd year: Number of plants produced if every seed produces a new plant:	Y=10^2	100
3rd year: Number of plants produced if every seed produces a new plant:	Y=10^3	1000
4th year: Number of plants produced if every seed produces a new plant:	Y=10^4	10000

Graph of bean population

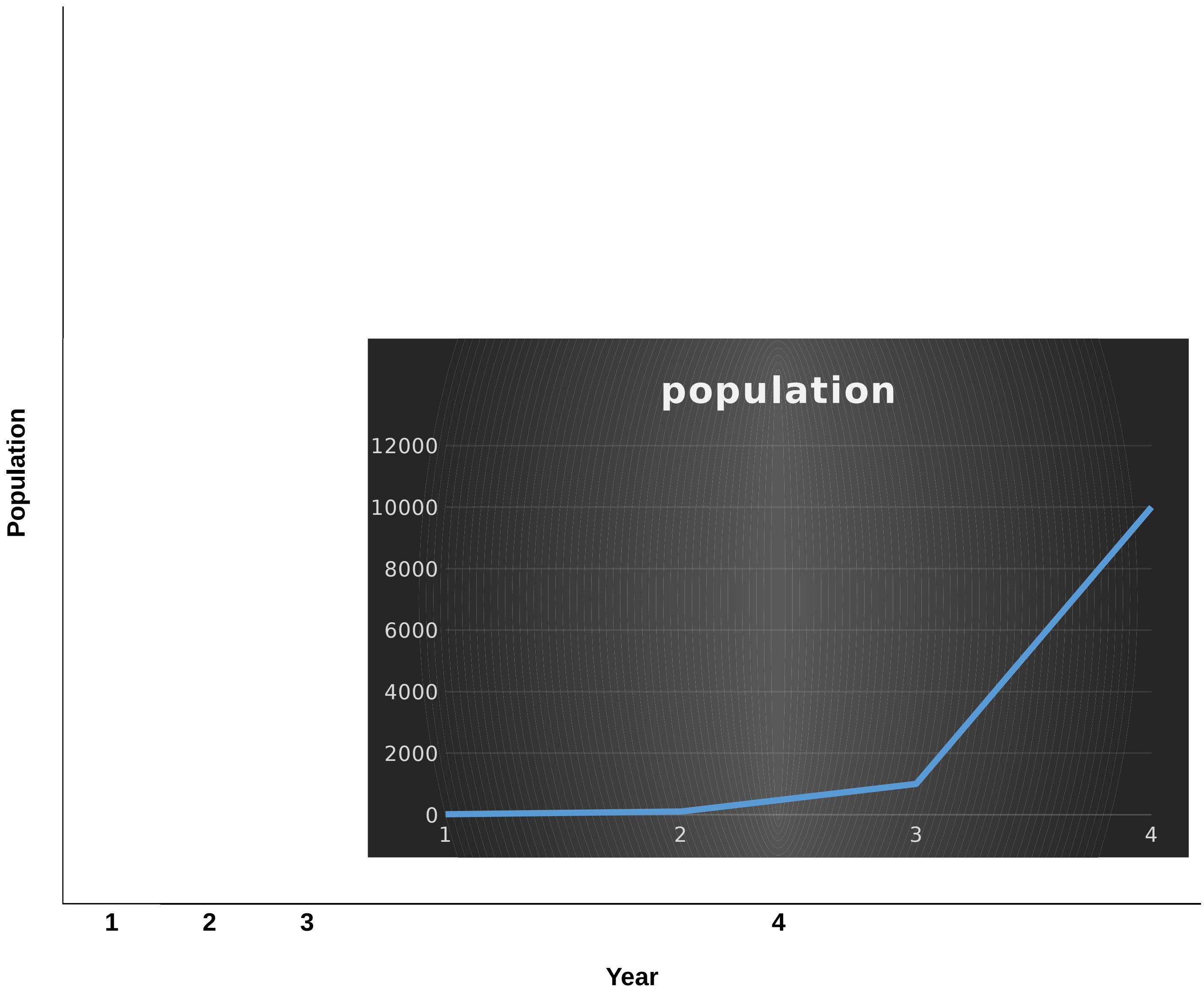

Table 2. ***Summary of Biotic Potential for the Pepper***

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:	Y=100^1	100

2nd year: Number of plants produced if every seed produces a new plant:	Y=100^2	10000
3rd year: Number of plants produced if every seed produces a new plant:	Y=100^3	1000000
4th year: Number of plants produced if every seed produces a new plant:	Y=100^4	100000000

Graph of pepper population