Virtual lab #3

Science, Biology

Population Biology Table I: Day P. caudatum alone, cells/mL P. aurelia alone, cells/mL P. caudatum mixed, cells/mL

P. aurelia mixed, cells/mL

0

2

2

2

2

2

8

8

12

8

4

26

50

20

32

6

52

86

20

66

8

56

98

18

82

10

60

98

10

92

12

58

98

6

96

14

58

98

0

96

16

56

98

0

96

Journal Questions:

1. Make a hypothesis about how you think the two species of Paramecium

will grow alone and how they will grow when they are grown together. Indeed, the two species of Paramecium will grow together and separately. However, one of the species will grow at a rapid rate as compared to the other. The experiment aimed to observe intraspecific competition between different species. The two specied depended on bacteria on rice grains as a source of food.

2. Explain how you tested your hypothesis.

Three tubes were used to test the hypothesis. The first tube contained Paramecium caudatum while the second one had Paramecium aurelia. The two species were mixed in the third tube. A sample of 0. 5ml was put on three slides for observation under the microscope. The three slides were observed severally and the number of species counted and recorded.

3. On what day did the Paramecium caudatum population reach the carrying capacity of the environment when it was grown alone? How do you know?

Paramecium caudatum reached the carrying capacity of the environment on the 10th day when grown alone. To support the claim, the species attained its highest count on that day. The species attained a maximum number of 60. After the 10th day, the species did not grow any further due to the limited resources in its environment. Infact, the species population started to diminish the following days. However, the species died off after mixing with Paramecium caudatum to share the same ecological niche.

4. On what day did the Paramecium aurelia population reach the carrying capacity of the environment? How do you know?

On the other hand, Paramecium aurelia reached its population capacity of the enviroment on the 8th day. On the 8th day, the species attained a

maximum number of 98 organisms. When grown alone, the species recorded its highest count on this specific day. It maintained the same number count for the next days. On the other hand, it had a slightly lesser count when mixed with Paramecium caudatum. In this case, it had a muximum number on the 12th day.

5. Explain the differences in the population growth patterns of the two Paramecium species. What does this tell you about how Paramecium aurelia uses avalable ressources?

The differences in population growth patterns between the two species results from the way each individual species utilizes its available resources. In this case, Paramecium caudatum utilizes more resources hence resulting to a lower population count. However, Paramecium aurelia has a high population count because each individual organism utilizes lesser available resources when gown alone.

6. Describe what happened when the Paramecium populations were mixed in the same test tube. Do the results support the principle of competitive exclusion?

According to the principle of competitive exclusion, thwo or more species competing for the same available resources cannot co-exist in the same environment keeping other factors constant. When mixed in the same test tube, Paramecium aurelia survived while Paramecium caudatum died off. In this scenaio, Paramecium aurelia had the advantage of survival and high population growth rate.

7. Explain how this experiment demonstrates that no two species can occupy the same niche.

As demonstrated in this experiment, no two species can occupy the same ecological niche keeping other factors constant. As a result, one species will have an avantage and dominate over the other one. The superior speciea will have much of the available resources and dominate the ecological niche. Hence, the less advantaged species will die off.

Post-laboratory Questions:

1. Paramecia possess:

a. A nucleus

b. Flagella

c. A contractile vacuole

d. A and C

e. All of the above

2. The organisms used in this experiment belong to which domain of life?

a. Bacteria

b. Archaea

c. Eukarya

3. What served as the food for the paramecia in this experiment?

a. Rice

b. Oats

c. Bacteria

d. Nothing, they are photosynthetic

4. Which of the following can influence the carrying capacity of a population?

a. Availability of food

b. Availability of water

c. Competition

d. Build up of toxins

e. All of the above

5. Which type of competition would be observed between organisms within the P. caudatum culture?

a. Interspecific

b. Intraspecific

c. There would be no competition, they are of the same species

6. Which culture reached its carrying capacity the fastest in this experiment?

a. P. caudatum, alone

b. P. aurelia, alone

c. P. aurelia, mixed

7. You have counted 30 organisms in your culture on Day 4. The concentration of organisms in this culture is:

a. 15 cells/mL

b. 30 cells/mL

c. 60 cells/mL

d. 90 cells/mL

8. Based upon your data, which culture experienced the greatest rate of exponential growth?

a. P. caudatum, alone

b. P. aurelia, alone

c. P. caudatum, mixed

d. P. aurelia, alone

9. Based upon the data, which organism appeared more efficient at using its resources?

a. P. caudatum

b. P. aurelia

10. In a repeat of this experiment, you found that on Days 10-16 the number of individuals in the P. caudatum, mixed culture began to gradually rise. A possible explanation for this is:

a. There was insufficient food in the culture

b. The temperature warmed enough to allow for more growth

c. A genetic variant of the original population began to experience growth due to its use of a different food (bacterium) source

d. None of the above could lead to this scenario