Passage IV

Two studies were done to examine how the proportion of *vermicompost* (feces from earthworms) in a particular potting soil affects the *yield* of each of 2 plant species: *Solanum lycopersicum* (a tomato plant) and *Capsicum annuum* (a pepper plant). The yield of a plant species is the mass of fruit produced per plant of the species.

Six different mixtures (Mixtures 1–6) were prepared according to the percents listed in Table 1.

Table 1

Mixture	Percent by volume of: vermicompost	potting soil
1	0	100
2	20	80
3	40	60
4	60	40
5	80	20
6	100	0

Study 1

Equal amounts of Mixtures 1–6 were distributed among thirty-six 2 L pots in the following manner: 1.5 kg of Mixture 1 was put into each of 6 pots, 1.5 kg of Mixture 2 was put into each of 6 other pots, 1.5 kg of Mixture 3 was put into each of 6 other pots, and so on. Then, 3 *S. lycopersicum* seeds were added to each pot. For the next 158 days, all the pots received equal amounts of water and light. On Day 28 of the 158 days, all the seedlings that had emerged were removed from the pots with the exception of a single seedling in each pot. On Day 158, the yield of the remaining plant in each pot was measured. The average yield of the plants grown in each mixture was then calculated. The results are shown in Figure 1.

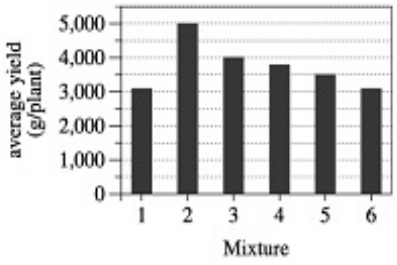

Figure 1

Figure 1 adapted from Rola M. Atiyeh et al., "Influence of Earthworm-Processed Pig Manure on the Growth and Yield of Greenhouse Tomatoes." ©2000 by Elsevier Science Ltd.

Study 2

The procedures of Study 1 were repeated, except that 5 *C. annuum* seeds instead of 3 *S. lycopersicum* seeds were added to each pot, the pots received water and light for 149 days instead of 158 days, seedling removal occurred on Day 42 of the 149 days, and plant yield was measured on Day 149. The results are shown in Figure 2.

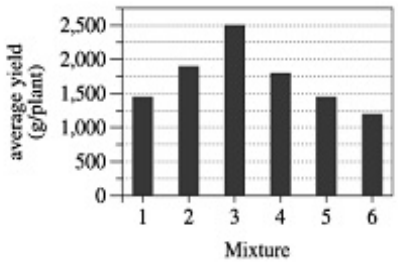

Figure 2

Figure 2 adapted from Norman Q. Arancon et al., "Effects of Vermicomposts Produced from Food Waste on the Growth and Yields of Greenhouse Peppers." ©2004 by Elsevier Science Ltd.

21. In both studies, as the percent by volume of vermicompost increased from 0% through 100%, the average yield:

A. decreased only.
B. increased only.
C. decreased, then increased.
D. increased, then decreased.

22. In Study 1, which of the following mixtures was most likely intended to serve as a control for the effect of vermicompost on plant yield?

F. Mixture 1
G. Mixture 2
H. Mixture 4
J. Mixture 5

23. Suppose that in Study 1, average yield had been calculated in *kilograms* per plant (kg/plant) instead of g/plant. The average yield for Mixture 5 would have been:

A. 1.45 kg/plant.
B. 3.50 kg/plant.
C. 14.5 kg/plant.
D. 35.0 kg/plant.

24. Which of the factors listed below were the same in Study 2 as they were in Study 1 ?

I. Number of pots used per mixture
II. Length of time needed to perform the study
III. Volume of each pot

F. I and II only
G. I and III only
H. II and III only
J. I, II, and III

25. Is the statement "Tomato plants require a *lower* proportion of vermicompost in the potting soil to achieve maximum yield than do pepper plants" consistent with the results of Studies 1 and 2 ?

A. Yes; in Study 1, the greatest average yield was attained with Mixture 2, whereas in Study 2, the greatest average yield was attained with Mixture 3.
B. Yes; in Study 1, the greatest average yield was attained with Mixture 3, whereas in Study 2, the greatest average yield was attained with Mixture 2.
C. No; in Study 1, the greatest average yield was attained with Mixture 2, whereas in Study 2, the greatest average yield was attained with Mixture 3.
D. No; in Study 1, the greatest average yield was attained with Mixture 3, whereas in Study 2, the greatest average yield was attained with Mixture 2.

26. In a 2 L pot, the presence of more than one plant can negatively affect the growth of all the plants in the pot, due to competition among the plants. What action was taken in the studies to prevent competition among the plants?

F. Only one seed was planted per pot.
G. Only one seedling was planted per pot.
H. After an initial period of growth, all but one seed was removed from each pot.
J. After an initial period of growth, all but one seedling was removed from each pot.

27. *S. lycopersicum* and *C. annuum* required water and light for the process represented by which of the following expressions?

A. Water + light → glucose + oxygen + carbon dioxide
B. Glucose + water + light → oxygen + carbon dioxide
C. Oxygen + water + light → glucose + carbon dioxide
D. Carbon dioxide + water + light → glucose + oxygen