TUTORIAL – INDUSTRIAL AND FOOD MICROBIOLOGY - 2022

1. a. What are the different categories of natural microbial products?
   b. What are the factors that need to be considered when constructing fermenters?
   c. What are the possible consequences of microbial contamination in a fermenter?

2. Briefly discuss the following:
   a. Use of crude media for fermentations.
   b. Problems associated with cell disruption in the product recovery process.
   c. Factors affecting solid substrate fermentations.

3. Write short notes on
   a. Importance of anaerobic respiration
   b. Bioreactors use in solid substrate fermentations
   c. Physiological steady state in a chemostat.

4. Discuss the factors that need consideration in selecting unit operations in the product recovery process.

5. Explain the following:
   a. Struggle to death increases the spoilage in fish.
   b. The temperature of the water in which fish live affect their spoilage.
   c. Modified atmosphere packed fish cannot be kept as long as modified atmosphere packed meat

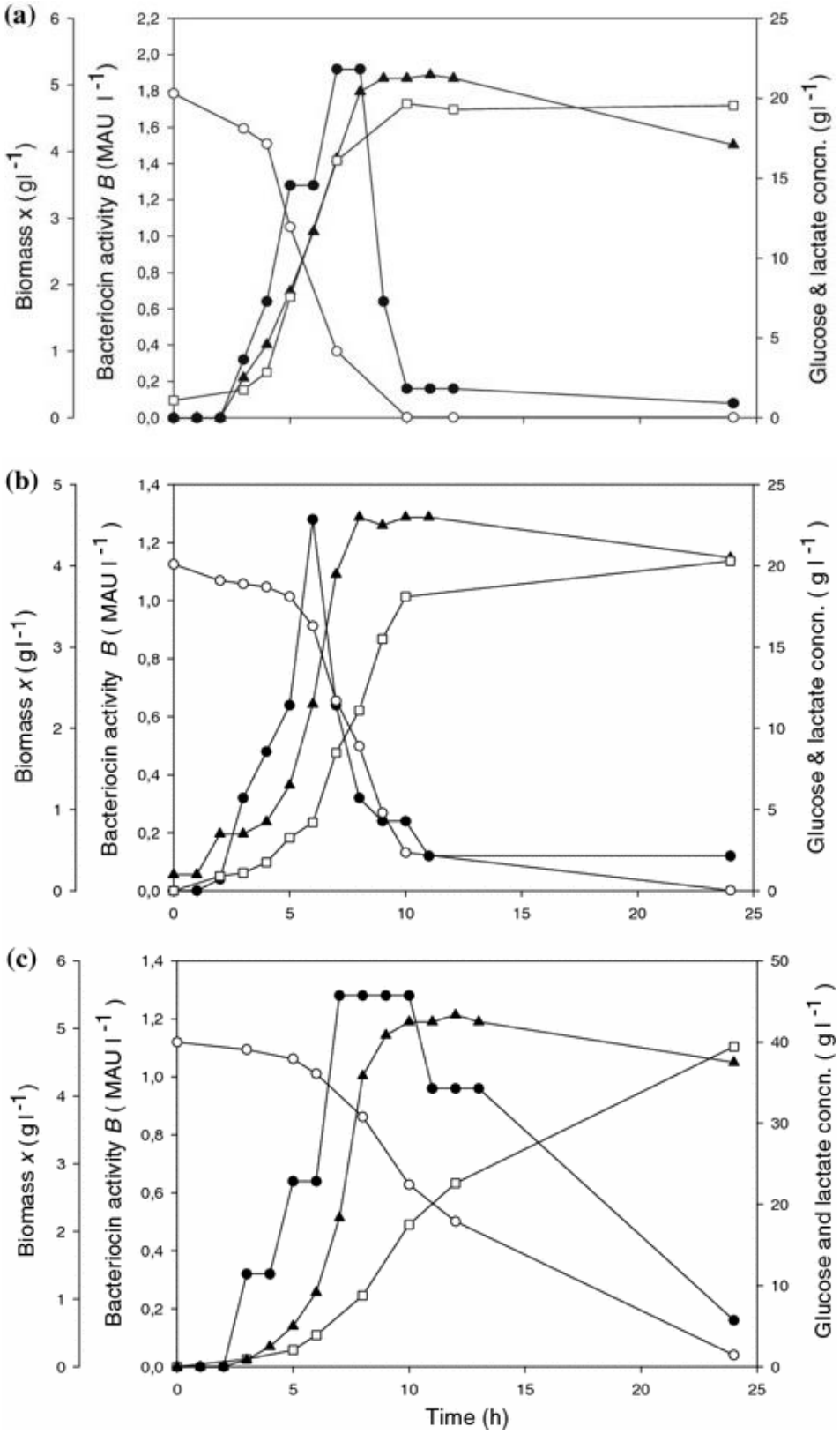
6. Briefly explain how the different steps of canning meet the microbial principles of preservation.

7. Write brief notes on the following:
   i. Use of antibiotics in preserving meat.
   ii. Water activity of foods in relation to their spoilage.

8. The following figure shows three fermentation profiles (a, b and c) of production of ''bacteriocin'' in batch cultures by a *Streptococcus* strain at 37°C and pH 6.2 in a particular broth with different initial concentrations of complex nitrogen source (CNS) and glucose.
   a. Initial concentrations of 50 g l^{-1} of CNS and 20 g l^{-1} of glucose
   b. Initial concentration 25 g l^{-1} of CNS
   c. Initial concentration 25 g l^{-1} of CNS

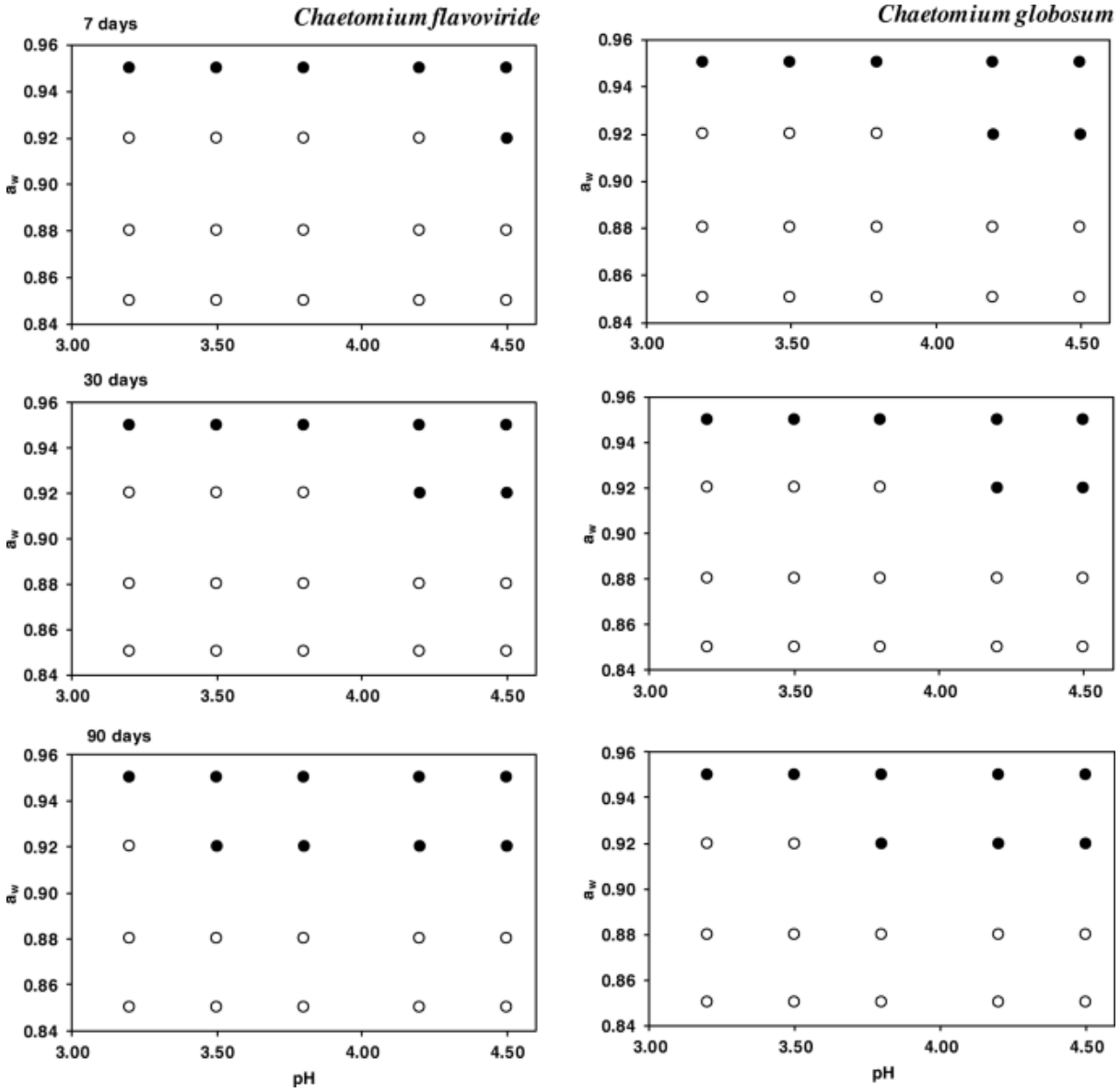
   i. What are the initial concentrations of glucose in b and c profiles?
   ii. What is (or are) the main factor (or factors) that affect the bacteriocin production? Explain.
   iii. What is (or are) the main factor (or factors) that affect the bacterial growth? Explain.
   iv. Which of the three profiles would you consider is the best for the extraction of bacteriocin? Explain.
   v. Briefly describe how the bacteriocin production is related to the bacterial growth.

vi. Giving reasons, suggest a change that can be made in the system to maintain the bacteriocin production at a higher concertation for a longer period?



Biomass (g l^{-1}) (▲), bacteriocin activity (MAU l–1) (●), residual glucose concentration (g l–1) (○) and cumulative lactate concentration (g l–1) (□)

9. The contamination and spoilage fungal ascospores is of high concern in fruit products like jam etc. The following figure shows the results of an experiment conducted to determine the effect of different factors on the growth of two fungus species. The solid circles represent growth and open circles represent no growth.



1. Define a_w.
2. What are the factors against which the growth of fungi tested?
3. Briefly describe the effect of the tested factors on the growth of the two strains.
4. Give possible reasons for the observed pattern of growth.
5. Suggest any other possible preservative technique to control the reasons you have given above.
6. Briefly describe the concept of hurdle technology used in food preservation based on this figure.