

The Effect of Different Cryoprotectants on the Survival Rate of Freeze-dried Lactic Acid Bacteria (LAB) Powder for Cucumber Fermentation

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INTRODUCTION & AIM

- ☐ **Cryoprotectants** are substances used to protect biological tissues and cells from damaged caused by freezing.
- ☐ **Freeze drying** is widely used to preserve LAB, but the process can cause cell damage and reduce bacterial viability.
- ☐ This study aimed to evaluate the effectiveness of various cryoprotectants on the survival rate of fermenting cucumbers using freeze-dried LAB powder.

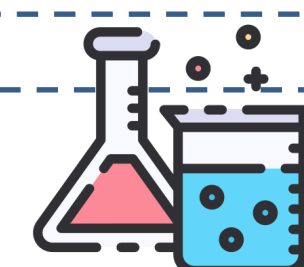
METHOD

Experimental design

- ☐ The preparation of freeze-dried LAB with cryoprotectants was done in different ratios, including 1:10 and 1:2.
- ☐ The types of cryoprotectants used in this study are as follows: **saline (CPT1)**, **skim milk (CPT2)**, **sucrose (CPT3)**, **skim milk mixed with sucrose (CPT4)**, **maltodextrin (CPT5)**, **lactose (CPT6)**, and **glucose (CPT7)**.

Quality analysis

- ☐ **Survival rates** = $\frac{N_f}{N_i} \times 100$
- ☐ **Physicochemical parameters:** Moisture content, Water activity, pH, Total acidity, Reducing sugar, Total soluble solids (TSS), and Salt content.
- ☐ **Sensory evaluation**



RESULTS & DISCUSSION

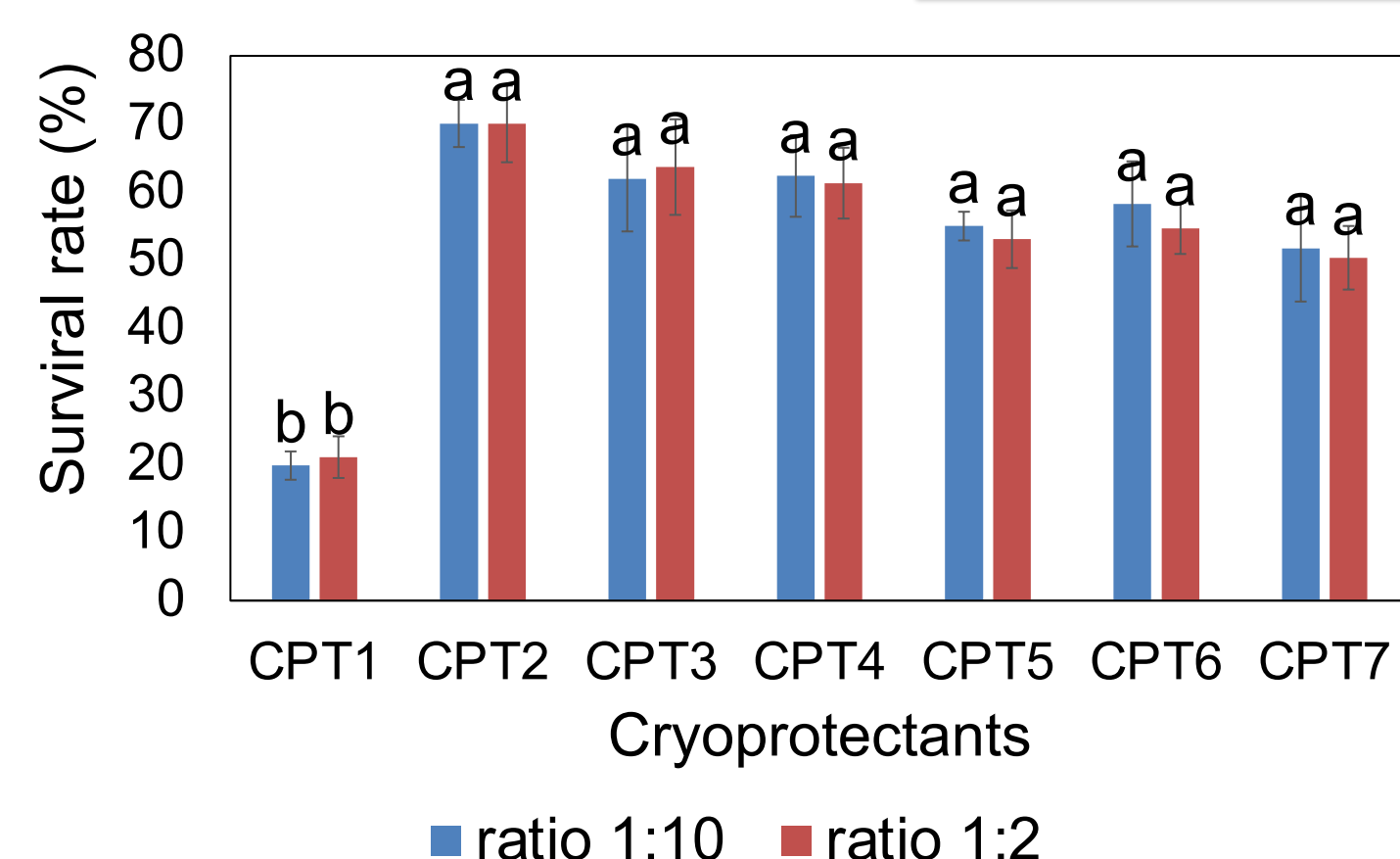


Figure 1. Survival rate of A3 strain in 24h at 4°C

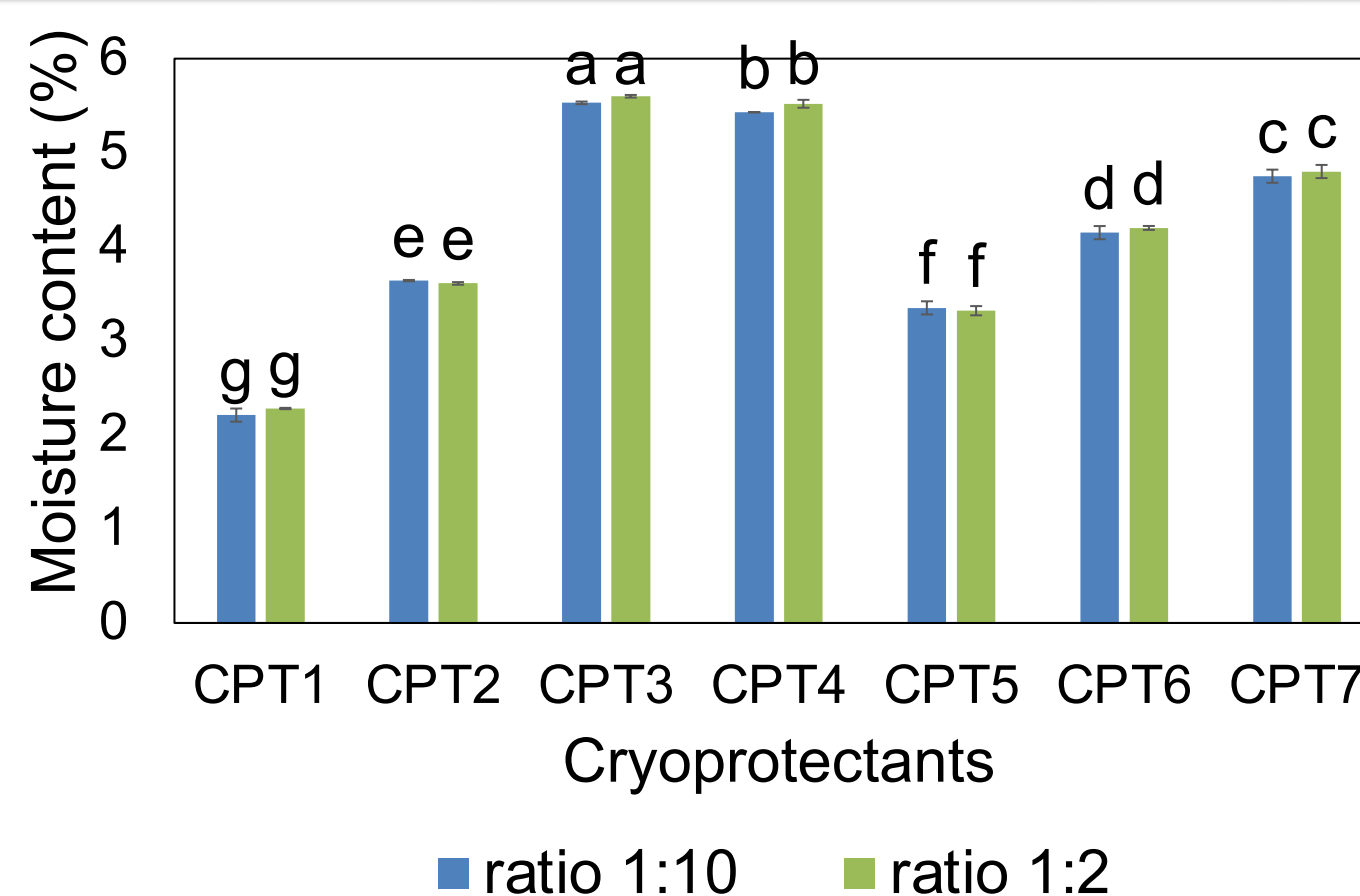


Figure 2. Moisture content of freeze-dried LAB

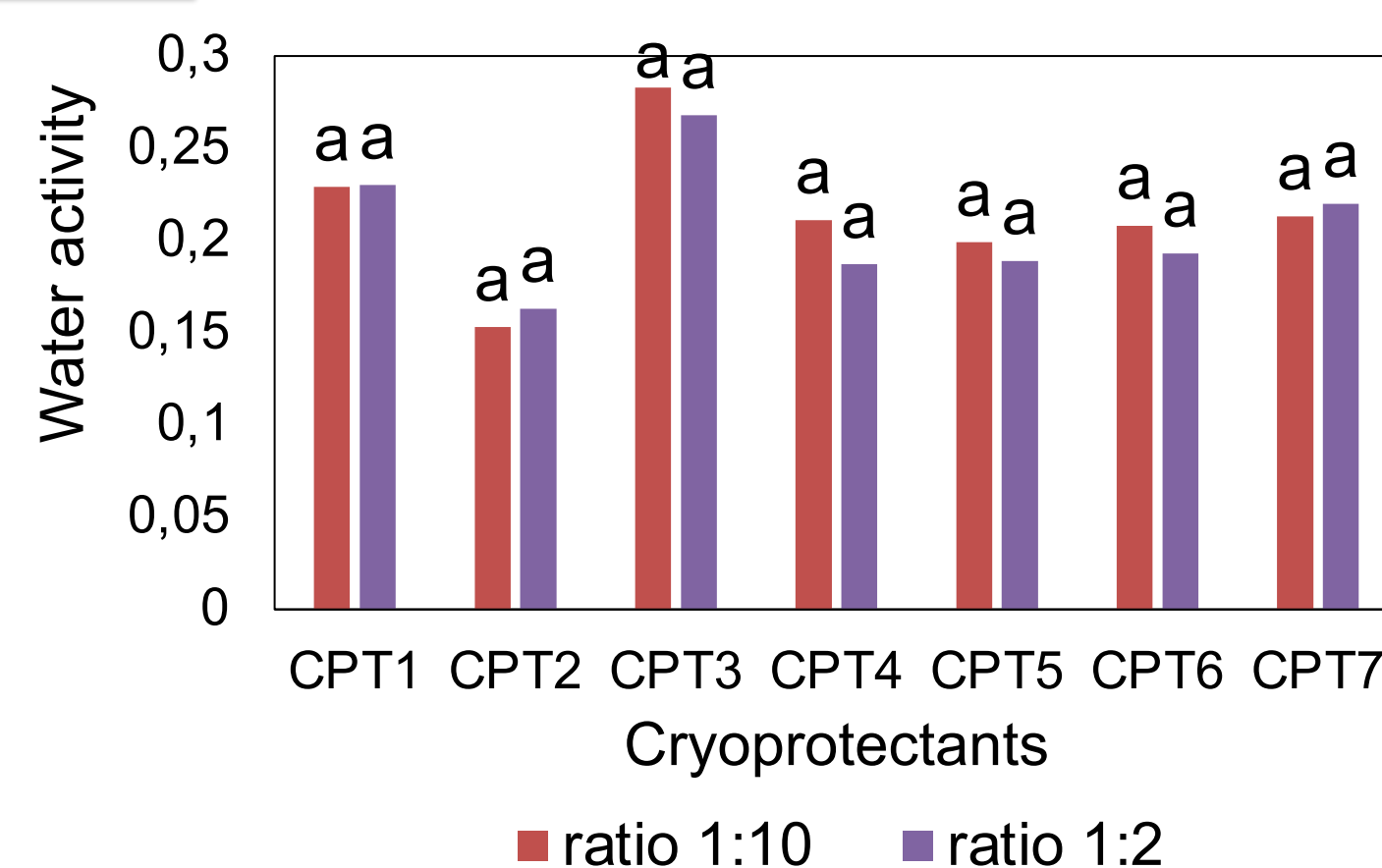


Figure 3. Water activity of freeze-dried LAB

Table 1. Physicochemical parameters of cucumber fermentation during 48 hours.

LAB	Spontaneous	Skim milk (1:10)	Skim milk (1:2)	Pure culture
pH	3.44±0.02 ^{ab}	3.42±0.007 ^b	3.34±0.014 ^b	3.48±0.007 ^a
Total acidity (%)	0.47±0.02 ^a	0.49±0.02 ^a	0.47±0.02 ^a	0.49±0.02 ^a
Reducing sugar (g/L)	0.59±0.003 ^a	0.12±0.02 ^b	0.07±0.0006 ^{bc}	0.04±0.003 ^c
TSS (°Brix)	4.05±0.07 ^a	4.05±0.07 ^a	4.10±0.00 ^a	4.25±0.07 ^a
Salt content (%)	2.16±0.007 ^a	2.23±0.02 ^a	2.32±0.007 ^a	2.36±0.02 ^a

NOTE: Each value is presented as mean ± standard deviation. *a-c* mean with the same letter within the same column are not significant different ($p \geq 0.05$).

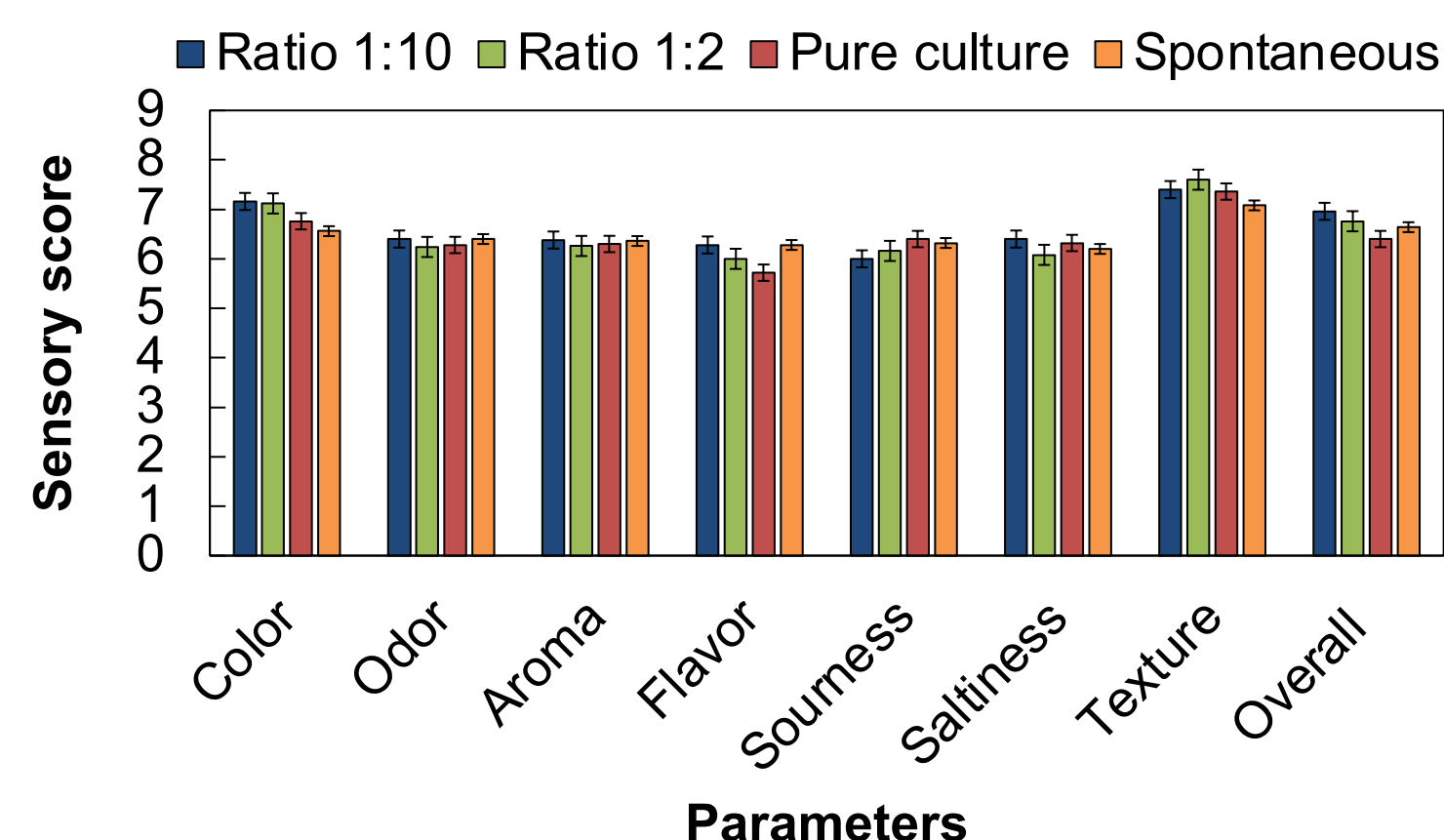


Figure 4. Sensory evaluation on cucumber fermentation

CONCLUSION

- ☐ Freeze-drying LAB with skim milk is effective for the LAB yielding a survival rate of ~70%.
- ☐ Skim milk was selected for cucumber fermentation.
- ☐ The moisture content of the freeze-dried LAB varied significantly ($p \leq 0.05$) among different cryoprotectants, while the water activity showed non-significantly difference ($p \geq 0.05$).
- ☐ There was no significant difference in pH, total acidity, reducing sugar, total soluble solids, and salt content.
- ☐ Cucumber fermentation using lyophilization powder is acceptable to consumers.

RECOMMENDATION

- ☐ Study the shelf-life of lyophilized LAB
- ☐ Control the stability of the temperature and pressure during freeze-drying process.

ACKNOWLEDGEMENT

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