

Evaluation of physicochemical, microbiological, and sensory profiles of vacuum-packed cooked low-salt pork belly under refrigeration and room-temperature storage

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INTRODUCTION

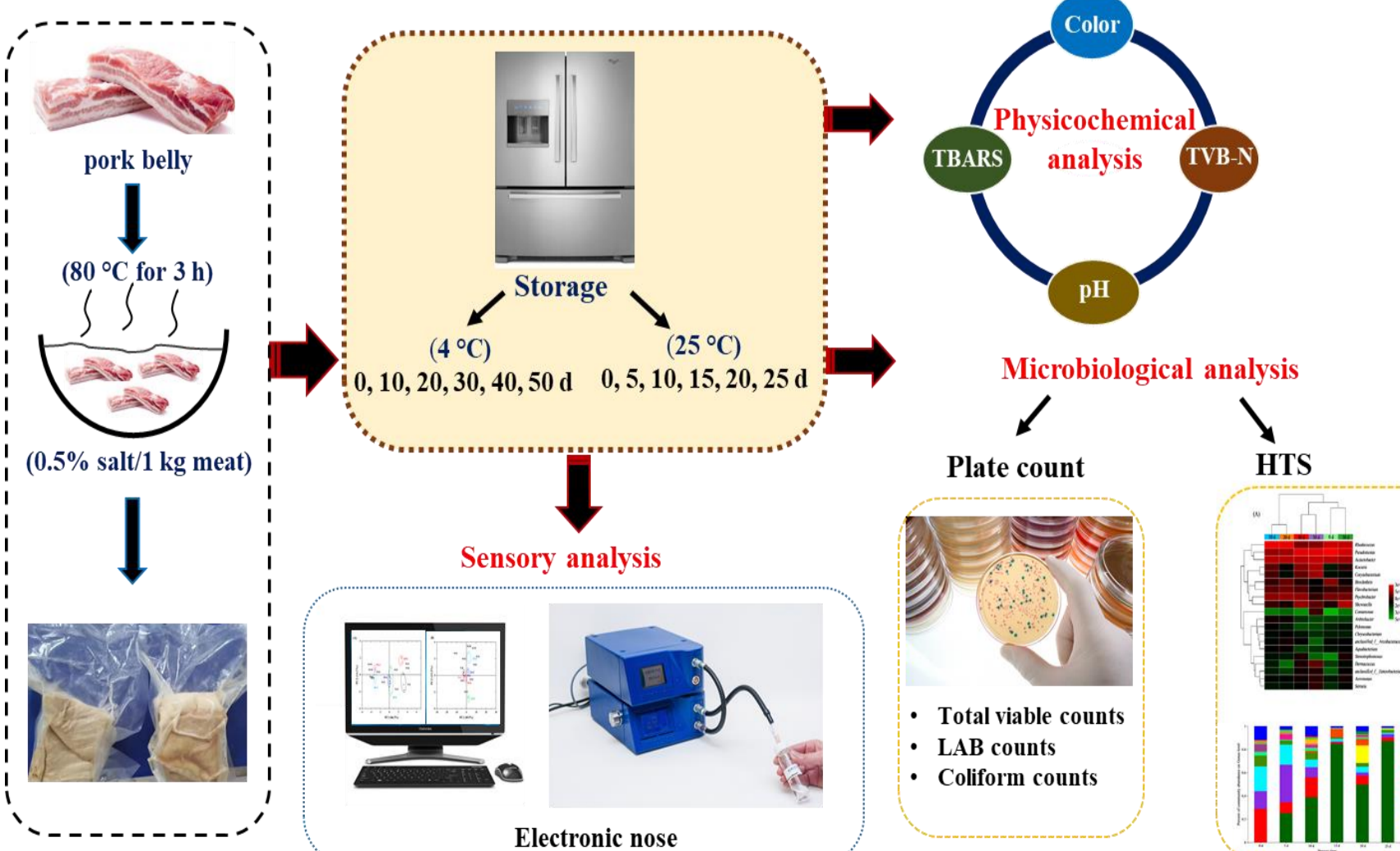
- Adequate packaging, such as vacuum packaging (VP) has played a remarkable role in reducing meat deterioration and extending shelf life.
- Unfortunately, the collapsing the film around the product often leads to an unsatisfactory package or vacuum degree.
- Pi-Vac, a vacuum-free pack, provides an innovative and efficient way to create an air-free meat package.
- This technology was recently introduced in Europe and limited in developing countries, including China.

AIM

Following the need to focus on promoting compliance and adherence to low salt intake, this study assessed:

- The physicochemical, microbiological, and sensory profiles of low-salt pork belly under refrigeration (4°C) and room-temperature (25°C) to mimic temperate and tropical conditions.

METHOD



RESULTS

- The pH values of samples under 50 d and 25 d storage were 6.54 and 6.89, respectively ($p < 0.05$), indicating the influence of temperature on pH increase. TVB-N contents increased with meat storage, reaching 15.23 mg/100 g (50 d) and 19.04 mg/100 g (25 d) throughout storage ($p < 0.05$), thus exceeding the Chinese National Standard (GB2707–2016) limit of 15 mg/100 g for meats [1]. TBARS contents in products under 4 °C and 25°C exceeded the borderline of malodor detection in meat (0.5 mg MDA/kg) from 30 d and 15 d, respectively, indicating the initiation of lipid oxidative changes (Fig. 1).
- The TVC of samples exceeded the permissible limit for meat products (4 log CFU/g) on 30 d (4 °C) and 15 d (25°C), respectively. However, the product was not undesirable until 40 d to 25 d, respectively. LAB counts ranged from 1.18-6.07 (4 °C) and 1.18-6.51 (25 °C) log CFU/g, while coliform counts reached 4.94 (4 °C) and 5.31 (25 °C) log CFU/g throughout storage ($p < 0.05$). LAB are more tolerant of CO₂, whereas coliform are often considered precursors of fecal contamination and pathogenic enteric bacteria (Fig. 2).[2]
- *Pseudomonas* and *Bacillus* dominated the samples at 4 °C and 25 °C, respectively. The prevalence could be attributed to the change in storage conditions of the samples (Fig. 2).
- E-nose sensitivity towards W1W (sulfides), W2W (organic sulfides), W2S (alcohols, aldehydes, and ketones), W6S (hydrides), and W5S (nitrogen oxides) sensors from 40 d (4 °C) and 25 d (25 °C) affirmed the period of significant deterioration (Fig. 3).[3]

Fig. 1: The pH (i), TVB-N (ii), and TBARS (ii) contents of VP low-salt pork belly at (A) 4 °C and (B) 25 °C storage for 50 d and 25 d, respectively. The lower cases (a–e) indicate significant differences across the storage times. The error bars are derived from the standard deviation of replicates (n = 3).

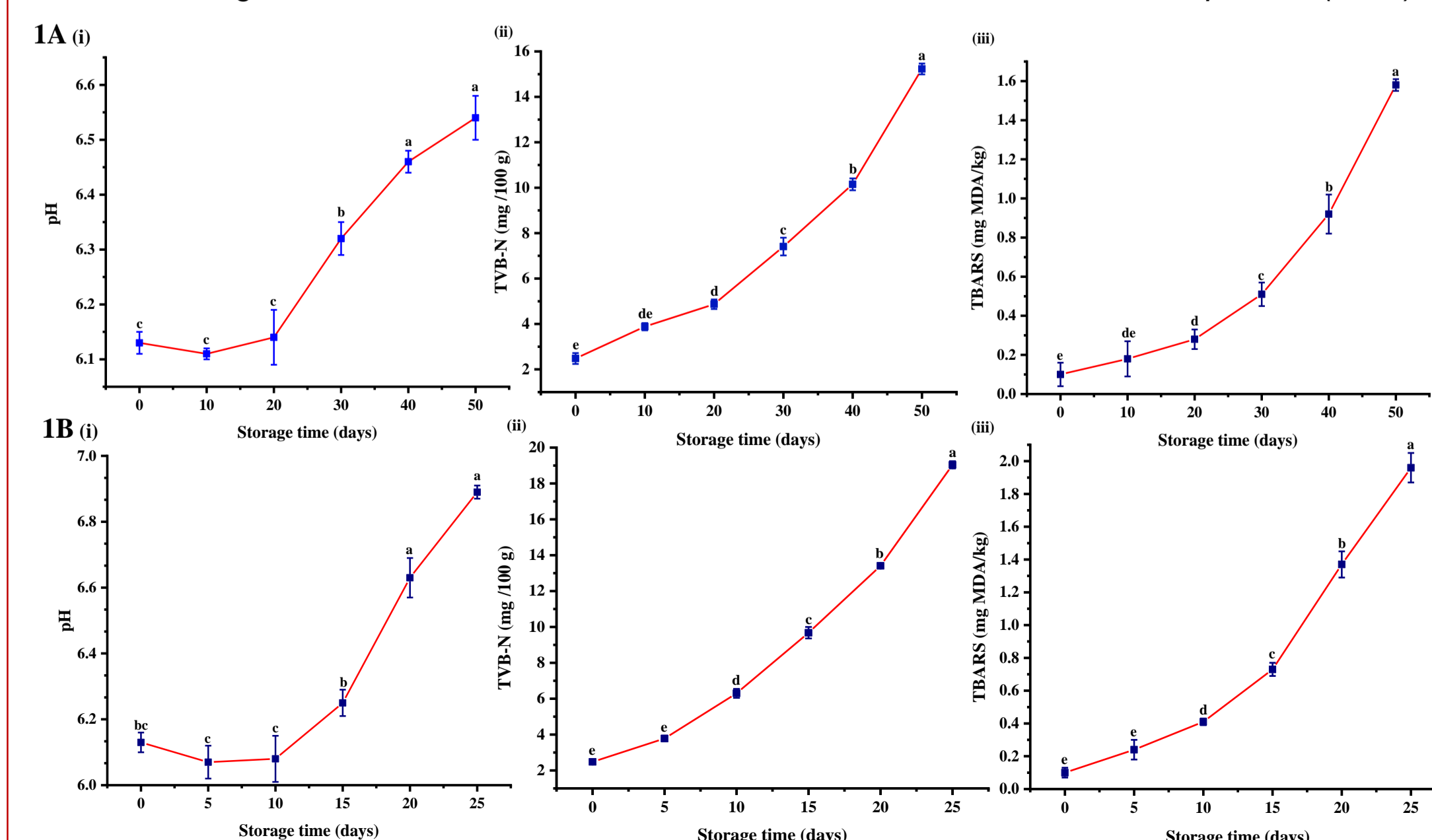


Fig. 2: The bacterial enumeration of VP low-salt pork belly at (A) 4 °C and (B) 25 °C storage for 50 d and 25 d, respectively. The lower cases (a–e) indicate significant differences across the storage times. The error bars are derived from the standard deviation of replicates (n = 3).

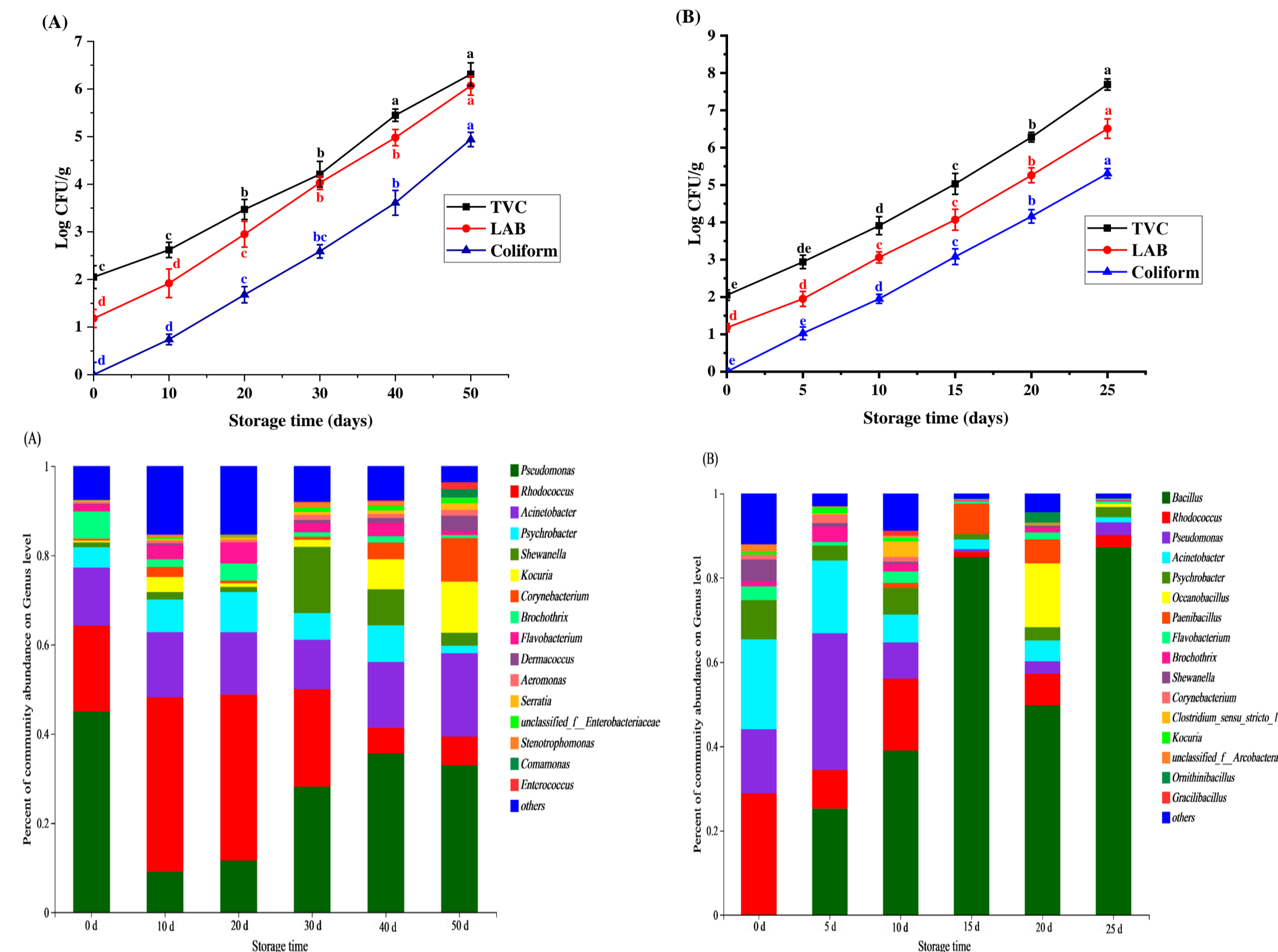
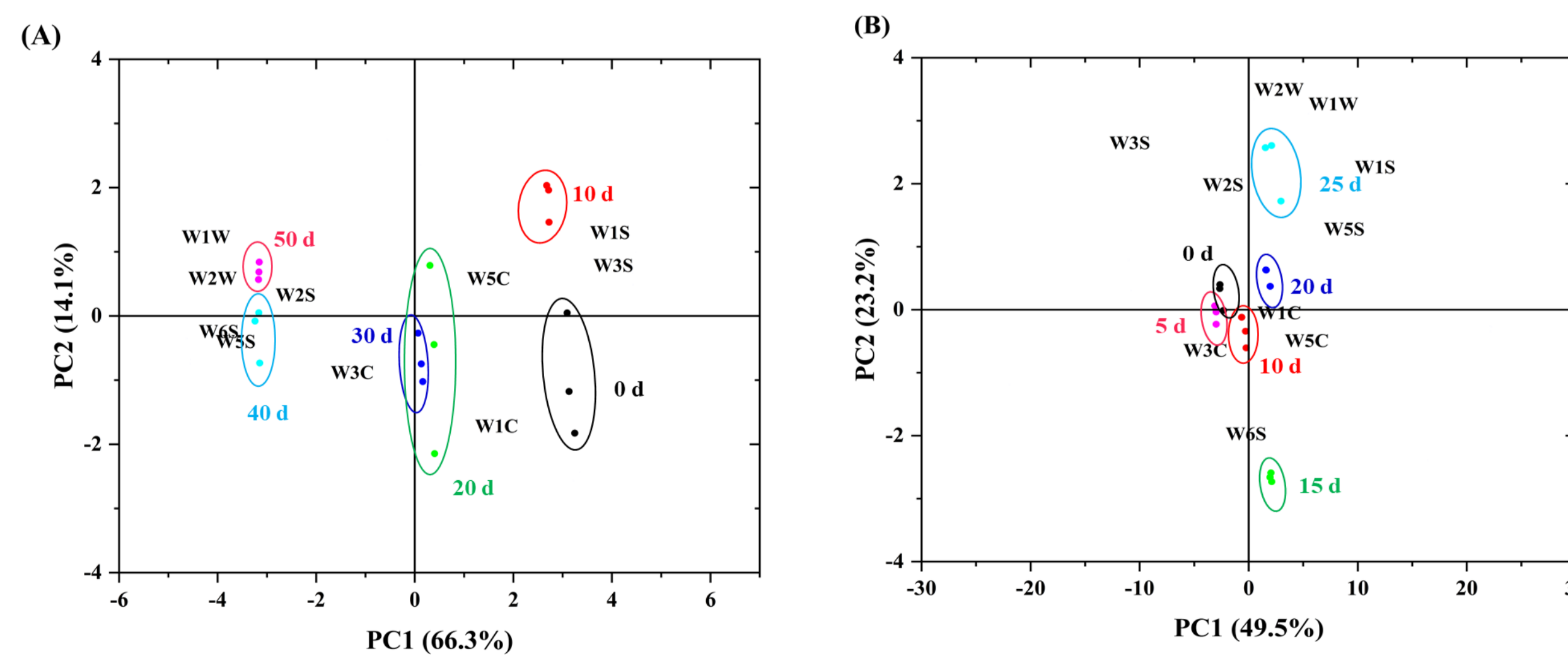


Fig. 3: E-nose principal component score plots of VP low-salt pork belly at (A) 4 °C and (B) 25 °C storage for 50 d and 25 d, respectively. Each sample was analyzed in triplicates (n = 3).



CONCLUSION

- Notwithstanding the effect of temperature in exacerbating oxidative processes, the packaging condition showed positive results in inhibiting pH, TVB-N, and TBARS contents in the samples over time.
- Rapid degradation was detected from 40 d (4 °C) to 20 d (25 °C), respectively.
- Although *Kocuria*, *Shewanella*, *Acinetobacter*, and *Psychrobacter* were detected in both groups, the prevalence of *Pseudomonas* (4 °C) and *Bacillus* (25 °C) demonstrated the impact of temperature conditions on bacterial consortia.
- E-nose sensitivity towards W1W, W2W, W2S, W6S, and W5S sensors on 40 d (Group A) and 25 d (Group B) affirmed the time points of rapid deterioration.

ACKNOWLEDGEMENT

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