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Addressing inefficient post-harvest practices to mitigate food waste in Malaysian food services

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ABSTRACT

In Malaysia, the small food producers include restaurant owners and hawkers. Studies have conclusively shown that food services contribute to approximately 26% of national food waste, primarily driven by inefficient post-harvest handling practices. In this study, the cause of inefficient post-harvest handling was identified with the aim of improving the management of fresh-cut produce within the food service industry. A total of 50 participants comprising cooks, kitchen staff, and restaurant managers were engaged to provide a comprehensive assessment of fresh-cut vegetable handling practices. This focus is particularly pertinent given that fresh vegetables are integral to Malaysian cuisine, and their improper handling can significantly contribute to food waste. The survey covers washing practices, storage methods, packaging type and food safety measures implemented throughout the handling of fresh vegetables until they are transformed into cooked products. The studies revealed several key findings, highlighting that inadequate temperature control and inconsistencies in cold chain logistics led to visible damage, wilting, and microbial contamination, especially in highly perishable vegetables like broccoli and salad. The predominant preservation methods identified were the removal of spoiled portions and size-based sorting. Nevertheless, limited adoption of refrigeration and advanced preservation technologies were the major causes of food waste and spoilage among the food handlers who are involved in food service industry. The finding obtain from this study is crucial to be used as fundamental background to set up the standardized protocol among small food handlers in Malaysia.

Key words: Small-scale food handler, food waste, sustainable agriculture, post-harvest, fresh-cut vegetables

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Introduction

Malaysia's multi-ethnic society predominantly comprise the Malay, Chinese, and Indian communities have actively contributed to diverse culinary landscape. This ethnic diversity has

fostered a natural fusion of culinary traditions, resulting in a vibrant and distinctive food culture. This diverse palate encourages small food handlers such as hawkers, street vendors, and home-based cooks to operate small food business that can cater specific need from the communities. Fresh vegetable is key part of traditional cuisine across Malay, Chinese, and Indian communities. Onion is a foundational ingredient across Malay, Chinese, and Indian cooking, used for their savory flavour and ability to build depth in dishes (Izzah et al., 2012). Broccoli and salad greens are increasingly used due to modern health trends, as they are rich in vitamins and fibre, and they blend well with both traditional stir-fries and Western-style fusion dishes. These vegetables are normally used as fresh-cut form due to convenience options to reduce the preparation time. Nevertheless, dealing with the fresh cut vegetable is tricky as it perishable that prone to spoilage and cause food waste problem in Malaysia (Haslinda et al., 2022). Factor such as temperature, washing technique, storage techniques and packaging method are among of important factors that influencing the post-harvest life and eating quality of vegetables. Temperature abuse during storage can lead to microbial spoilage and foodborne illness. Improper washing techniques and a lack of standards operating procedures for keeping the vegetables increase the risk of cross-contamination. Studies suggest that many food services operators rely on traditional methods that often do not align with food safety best practices (Neggazi et al., 2025). This study addresses these concerns by investigating the handling practices of fresh-cut vegetables in restaurants within a small town in Southern region of Malaysia that contributing to post-harvest losses with respect to commonly used fresh cut vegetable among Malaysian. The identified gaps could provide practical recommendations for improvement. The outcome of this research is expected to enhance operational efficiency within local restaurants and hawkers owned by small food producers to reduce food waste and promote sustainable food systems.

Material and Methods

The study was conducted to investigate post-harvest practices among food handlers located in the Pagoh area, Johor, Malaysia, between June and August 2024. There were 50 respondents for this study comprising chef (17%), kitchen staff (17%) and restaurant manager (16%) who were surveyed through personal interview. Careful thought went into designing the questionnaire to make sure that every question made a significant contribution to the overall goals of the study. A purposeful focus on key variables that contribute to post-harvest losses on selected vegetables (onion, broccoli, green salad, mustard and lemongrass) was questioned in a four-questions structured questionnaire probe into important areas such as pre-processing, storage, packaging and quality control practices. The responses collected were analysed descriptively using Minitab® Release 17.

Results and Discussion

Figure 1a shows the methods used to wash five vegetables (broccoli, mustard, lemongrass, onions, and green salad) before processing. Most respondents rinsed vegetables with cold water. Soaking in salt or vinegar and using commercial vegetable wash were rarely practiced. A small portion of lemongrass and onions were not washed at all prior to keeping and usage. This finding indicates that basic hygiene practices are not strictly followed which negatively could lead to foodborne illnesses (Neggazi et al., 2025). Thus, a code of practice need to be established to make sure that the food handlers are serving clean and healthy dishes to the consumers.

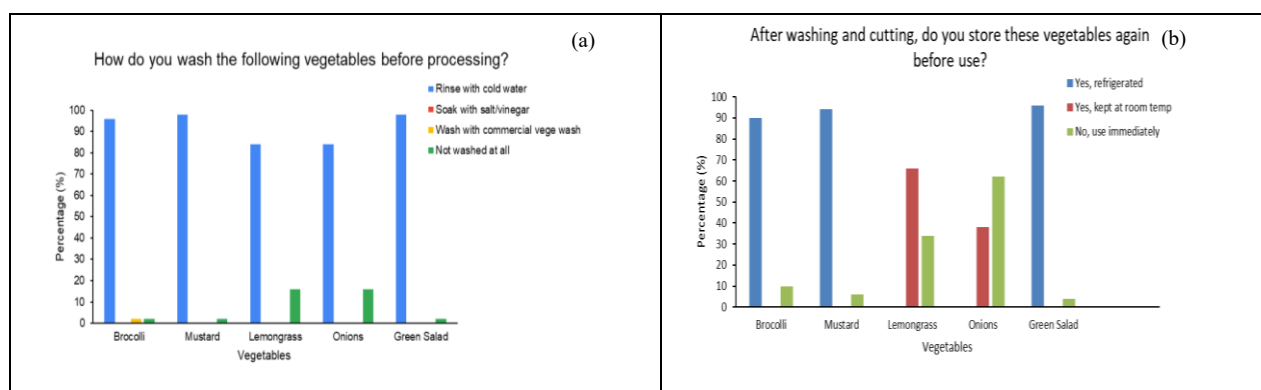


Figure1: Respondent answer from the perspective of pre-processing (a) and storage (b) from different vegetables

Upon pre-processing, most perishable items like broccoli and green salad are stored under refrigeration, while some vegetables (lemongrass and onions) are often used immediately or kept at room temperature (Figure 1b). The exclusion of tuber vegetables may be attributed to natural ability to remain firm and resist wilting at room temperature. Nevertheless, this practice could lead to temperature abuse that can accelerate wilting and microbial spoilage later shortens the shelf life (Venkatesan et al., 2024). These storage habits should be taken as intervention to reduce food waste in food services.

During storage, specific practices were applied, particularly when vegetables were kept for an extended period before use (Figure 2a). Among the six vegetables, onions and lemongrass were sometimes used immediately, while the others were typically stored in a refrigerator (Figure 1b). Broccoli was generally stored in airtight containers, whereas green salad and mustard greens were placed in plastic bags (Figure 2a). Lemongrass and onions were stored in mesh bags at room temperature. For leafy vegetables such as mustard greens and green salad, some respondents wrapped them in paper towels, kept them in water, or stored them in mesh or open containers. The variability of storage materials could be due to suitability of materials with limited adoption of proper preservation methods contributes to visible spoilage and waste. Improved packaging methods, such as vacuum-sealed bags or controlled-atmosphere storage, could enhance shelf life and meet the study's goal of reducing food waste (Moradinezhad et al., 2025).

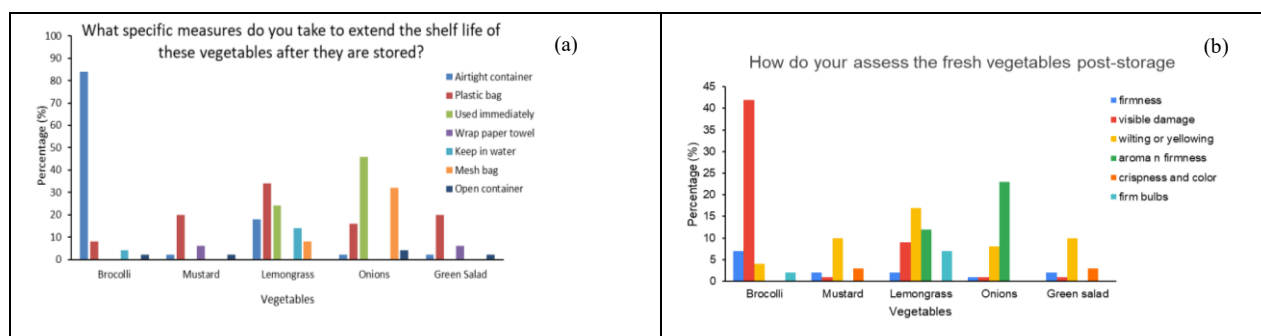


Figure 2: Respondent answer from the perspective of packaging type (a) and quality control and measurement post-storage from different vegetables

Post-storage vegetables are currently evaluated based on criteria such as firmness, visible damage, wilting or yellowing, aroma, crispness, color, and bulb condition (Figure 2b). At present, respondents primarily depend on visual and tactile inspection without standardized grading

procedures. The subjective assessment could lead to inconsistent handling decisions and the unnecessary rejection of vegetables that are still suitable for consumption (Si et al., 2022). To address this, it is advisable to develop a standardized code of practice for post-storage vegetable evaluation, incorporating well-defined grading criteria. Implementing standardized protocols, supported by visual guides and tactile reference scales, could minimize subjectivity to ensure consistent quality and reduce avoidable waste. Furthermore, linking visual cues to the biochemical characteristics of vegetables could help ensure vegetables are optimally utilized before spoilage occurs (Tran et al., 2024).

Conclusions and Recommendation

This study revealed that small-scale food handlers in Malaysia often rely on basic post-harvest practices, such as rinsing vegetables with cold water, simple packaging, and subjective visual quality checks, while proper cold storage and standardized procedures are inconsistently applied. These lacking could contribute to spoilage and food waste, particularly for highly perishable vegetables like broccoli and salad. Strengthening post-harvest handling through improved storage, packaging, and clear standard operating procedures is essential to reduce food waste and support sustainable food service operations.

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