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Assessment of Physical and Chemical Contaminants of Indoor Air Quality in Coffee Bean & Tea Leaf, Temu City, Elmina

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Structured Abstract

Background: Indoor air quality (IAQ) is an important environmental health factor in enclosed public spaces such as cafés, where continuous customer occupancy and beverage preparation activities may influence indoor conditions. High occupancy levels may affect ventilation effectiveness and indoor pollutant concentrations, yet IAQ assessments in café customer areas in Malaysia are limited. Therefore, this study assesses physical and chemical IAQ parameters in the customer seating area of Coffee Bean & Tea Leaf (CBTL), Temu City, Elmina.

Methods: Four sampling points were selected within the customer area to represent typical occupancy conditions. Measured physical parameters included temperature and relative humidity, while assessed chemical parameters were total volatile organic compounds (TVOCs), formaldehyde, carbon dioxide (CO_2), carbon monoxide (CO), PM_{10}, and $PM_{2.5}$. Measurements were obtained using real-time indoor air quality monitoring instruments operated according to manufacturer specifications. Data were analyzed descriptively and compared with relevant indoor air quality guidelines, including ICOP IAQ 2010 and World Health Organization (WHO).

Results: The recorded indoor air quality parameters were predominantly within the recommended guideline limits. The highest indoor temperature reached 26.2 °C, exceeding the 26.0 °C acceptable maximum limit specified by ICOP IAQ (2010) at one sampling point during a high occupancy period, while relative humidity remained within the acceptable range (40%-70%). Average concentrations of PM_{10} (0.0140 mg/m^3) and $PM_{2.5}$ (0.0048 mg/m^3) complied with the relevant guideline limits. Chemical parameters, including TVOCs (0.01 mg/m^3), formaldehyde (0.01 mg/m^3), and carbon monoxide (0 ppm), were consistently within acceptable levels. In contrast, carbon dioxide concentrations peaked at 1064 ppm, exceeding the 1000 ppm guideline limit during periods of increased customer occupancy, indicating occupancy-related ventilation limitations.

Conclusion: Overall, the indoor air quality in the customer area of CBTL Temu City, Elmina was generally acceptable under normal operating conditions. This study provides baseline IAQ data for café environments and highlights the influence of occupancy on indoor air quality parameters. The findings may support future studies examining ventilation performance and occupancy-related IAQ dynamics in non-industrial commercial settings.

Keywords: Indoor Air Quality, Occupancy Influence, Thermal Comfort, Chemical Contaminants

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