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Determination of polycyclic aromatic hydrocarbons in black tea at different processing stages

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Polycyclic Aromatic Hydrocarbons (PAHs) are ubiquitous organic molecules considered as environmental pollutants, generally enter to the environment during incomplete combustion of organic materials. Various foods have been contaminated from PAHs during preparation, processing or from the environment. The present study was carried out to investigate the occurrence of 16 priority PAHs, in black tea, collected from a tea factory. There were six samples of tea from the same batch and same grade at different processing stages that were analyzed. The Quick, Easy, Cheap, Effective, Rugged and Safe (QuEChERS) method was followed to prepare samples and the analysis was done by using gas chromatography- mass spectroscopy. The total PAHs contents of fresh tea leaves, withered, rolled, fermented, dried, graded tea were 26631.84, 59716.89, 43517.76, 11584.72, 7151.88, 16726.77 $\mu\text{g}/\text{kg}$ respectively. The results showed that the PAHs were high in withering and rolling steps than the other steps and high PAHs count in graded tea than dried black tea. Since the withering, rolling and tea grading steps are carried out close to the unloading bay and machinery, they could be contaminated from smoke of vehicles and factory smoke effluent. The fermented tea showed less PAHs content and that decrement could be due to volatilization and degradation of PAHs during fermentation. The PAHs contamination of tea leaves depend on the manufacturing premises, environmental condition, thermal energy type, dryer type and raw material conditions etc. The majority of detected PAHs in tea samples were of low molecular weights. According to International Agency for Research on Cancer, 2 and 3 ring PAHs were classified into group 2B and 3 according to the carcinogenicity; the agent possibly carcinogenic and not classifiable as to its carcinogenicity to humans respectively. Even though, tea was contaminated from PAHs, these PAHs are not harmful to the human health. Therefore, the consumption of black tea is safe to the humans.

Keywords: Black tea, Gas Chromatography Mass Spectroscopy, Polycyclic Aromatic Hydrocarbons, Processing stages, QuEChERS method