

**PERFORMANCE ANALYSIS OF PROTOTYPE FAR-INFRARED
TEA DRYER IN BLACK TEA MANUFACTURING**

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ABSTRACT

Sri Lanka and most of other countries are still using conventional type, Endless Chain Pressure Dryers and Fluidized Bed Dryers, which are energy inefficient. In addition to that, dendro-thermal power is used in these dryers, which causes environmental pollution and have many other limitations. Far infrared dryers are unavailable for industrial use at present. Therefore, this study was conducted with an objective of identifying the essentials for developing a prototype dryer using far-infrared radiation for black tea manufacturing. Further, the performance of the developed dryer and the quality of black tea dried using this dryer were assessed. Fermented tea dhool were dried by four 600W infrared panels, changing the combination of far infrared radiation temperatures (255 °C, 220 °C, 200 °C, 185 °C and 170 °C) and exposure times (1 min, 1.5 min, 2 min, 2.5 min, 3 min and 3.5 min) with the design of two factor factorial design replicating each three times. A K-type thermocouple thermometer was used to measure the temperature. The results revealed that, total polyphenol content of dried tea decreases with the exposure time in all temperature levels. Specific energy consumption showed inversely proportional relationship with the temperature. The liquid flavor, liquid aroma and infused leaf colour were almost similar for the tea samples dried using prototype drier and normal factory dried tea samples. However, the optimum combination of temperature and exposure time of dhool was found to be 185 °C and 2.5 min for sample 22. Further sample 22 showed better estimated median value for liquor colour, dry leaf colour and dry leaf appearance too. Therefore, it can be concluded that, far-infrared has high potential as a source for drying the fermented tea dhools. Further studies should be conducted to improve the precision temperature control which could possibly make to utilize the high- temperature region of far-infrared.

Keywords: Far-infrared radiation, Dryer performance, Black tea manufacturing, Specific energy consumption, Sensory evaluation