

Study the Effect of Far infrared-Withering on Black Tea Manufacturing

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Withering is the foundation step of black tea manufacturing which directly influences the quality and the cup characteristics of the made tea. This stage consumes 49% of the total electricity required for the production process and use of dendro thermal power releases CO₂ to the environment causing environmental pollution. Far infrared (FIR) withering may be a good alternative to overcome these problems. Therefore, this study was conducted to identify the essentials for developing a withering trough using Far-infrared as the heating source for black tea production and to analyze its performances. Plucked tea leaves with an initial moisture content of 43±1% were withered using Far-infrared panels, by changing the treatment combination of Far-infrared power (650, 1300 and 1950 W), exposure times (4 hr, 4.15 hr and 4.30 hr) and the leaf weight (400 kg, 425 kg and 450 kg). Temperature and the relative humidity of plenum chamber and withered leaves were measured using DHT11 sensors to maintain the conditions uniformly throughout the study. The samples were dried and *Theaflavins (TF) Thearubigins (TR)* ratio was measured and organoleptic parameters such as aroma, flavor and colour were tested. It was found that there is a significant interaction effect of Far-infrared power, exposure time and leaf weight on "*Theaflavins/Thearubigins*" ratio and organoleptic properties ($p < 0.05$). The optimum combination of Far-infrared power, exposure time and leaf weight were 1950 W, 4.30 hours and 400 kg, respectively based on "*Theaflavin/Thearubigins*" (1 :10), high score for *organoleptic* properties and low energy consumption. Therefore, it can be concluded that FIR withering has high potential in black tea manufacturing. Further studies are needed to improve the precision of the prototype to develop it as an industrial level withering trough.

Keywords: Black tea manufacturing, Far- infrared withering, Sensory evaluation, Theaflavins, Thearubigins