

## **Fermentation and Drying Effects on Physical Properties, Theaflavins, Caffeine, and Sensory Acceptability of *Syzygium samarangense* Drink**

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### **Structured Abstract**

**Background:** *Syzygium samarangense* leaves, often considered waste, hold bioactive compounds with potential health benefits, making them suitable for a black tea-like beverage. However, under Food Regulations 1985, the product cannot be legally classified as "tea" since it is not derived from *Camellia sinensis*. The research investigates the effects of fermentation methods and drying techniques on the physical properties, theaflavins, caffeine, and sensory attributes of *Syzygium samarangense* drink. By optimizing these processes, this study aims to transform waste into a commercially viable beverage with enhanced health benefits and sensory appeal while adhering to regulatory standards.

**Methods:** *Syzygium samarangense* leaves were harvested, cleaned, soaked, withered, size-reduced, fermented and dried to achieve the final tea product. Then, the physical properties of *Syzygium samarangense* drink were determined including moisture content, water activity, bulk density, tapped density, specific gravity, pH value, colour L\*a\*b\*, total ash content and water extraction. Chemical analysis of *Syzygium samarangense* drink also has been examined including concentration and composition of theaflavins and caffeine. The *Syzygium samarangense* drink was evaluated using a 9-point hedonic scale, and the selecting percentage identified the best formulation.

**Results:** This study reveals fermentation process and drying methods, show a significant difference in physical and chemical analysis of drink. The most appropriate method for producing high-quality *Syzygium samarangense* black tea is fermenting for 14 days at 25°C with oven drying. This method meets key benchmarks, including moisture content (8.61%), water activity (0.714), bulk density (0.1016 g/mL), tapped density (0.1940 g/mL), specific gravity (1.012), and pH (5.92), ensuring quality and preservation. It yields excellent sensory attributes with the highest scores for colour (6.90), aroma (5.79), and overall acceptability (6.30), achieving a selective percentage (SP) of 65.27%. Additionally, it balances bioactive compounds, including caffeine (9.74 ppm) and theaflavins (1.325 ppm), making it the most suitable method for producing high-quality tea.

**Conclusion:** In conclusion, this study demonstrated that fermentation conditions and drying methods significantly influence the physical properties, theaflavins, caffeine content, and sensory acceptability of *Syzygium samarangense* drink. Among these, fermentation temperature had the greatest impact on quality, emphasizing its critical role in optimizing the production process for a high-quality, bioactive-rich, and sensory-appealing *Syzygium samarangense* drink.

**Keywords:** Fermentation, *Syzygium samarangense*, Drying Method, Theaflavins, Caffeine

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