

Effect of processing on antioxidant activity and phytochemical constituents of green, white, and black tea and tea flowers (*Camellia sinensis*)

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Tea (*Camellia sinensis*) is one of the most widely consumed beverages. This study evaluated the antioxidant activity and phytochemical constituents of different tea varieties based on their manufacturing processes. Four groups of tea samples (15 samples) were selected; comprising green tea (5 samples), white tea (3 samples), black tea (6 samples), and a tea flower infusion and further differentiated into flavored and unflavored varieties. Methanolic extracts were prepared and analyzed for antioxidant activity using the DPPH free radical scavenging assay. Total phenolic content (TPC) was determined using the Folin–Ciocalteu method while total flavonoid content (TFC) was measured using the $AlCl_3$ method. The major classes of bioactive compounds in tea, including alkaloids, flavonoids, polyphenols, tannins, saponins, terpenoids, carbohydrates, reducing sugars, steroids, and resins, were qualitatively analyzed using standard phytochemical screening tests. The DPPH assay, was highest activity in green tea with cinnamon (72.02%), followed by pure green tea (71.36%) and silvertip tea (70.05%). In TPC, the highest values were recorded in green tea with citrus (200.2 mg GAE/g extract), gunpowder tea (199.97 mg GAE/g extract), and organic green tea (165.4 mg GAE/g extract). The highest TFC

values were observed in gunpowder tea (105.08 mg QE/g extract), followed by black tea curl (57.33 mg QE/g extract), and pure green tea and decaffeinated tea (53.08 mg QE/g extract). Overall, the results indicate that green tea varieties including flavored blends and pure green tea and minimally processed white tea exhibit higher antioxidant activity and greater phytochemical content compared with black tea. Among the samples analyzed, gunpowder tea, pure green tea, and cinnamon green tea demonstrated the strongest antioxidant potential. These findings highlight the significant influence of tea processing on phytochemical composition and antioxidant potential, identifying certain tea varieties as rich sources of bioactive compounds.

Keywords:

Tea (*Camellia sinensis*), Antioxidant activity, DPPH radical scavenging assay, TPC, TFC

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