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**COMPARATIVE IN VITRO ASSESSMENT OF BLACK AND GREEN TEA EFFECTS ON THE
CORROSION AND MECHANICAL INTEGRITY OF ORTHODONTIC WIRES**

ABSTRACT

This in vitro study evaluated the comparative influence of black tea (5%) and green tea (3%) on the corrosion resistance and mechanical integrity of stainless steel (SS) and nickel titanium (NiTi) orthodontic wires. Sixty standardized specimens were immersed in tea solutions or distilled water over 28 days, simulating daily intake cycles. Surface morphology (SEM), elemental composition (EDX), tensile strength (Instron), surface roughness (profilometry), and corrosion potential (potentiostat) were assessed. Data were analyzed with one-way ANOVA followed by Tukey's post hoc test ($p \leq 0.05$). Black tea exposure produced significantly greater deterioration than green tea. In SS wires, chromium content decreased markedly (18.0% $\rightarrow$ 17.2%), tensile strength was reduced by 12.5%, surface roughness increased to 0.51 μm , and corrosion potential dropped to -342 mV. NiTi wires exhibited milder yet statistically significant changes. Black tea accelerates electrochemical corrosion and mechanical deterioration of orthodontic wires more than green tea, particularly in stainless steel. These findings underscore the need for patient dietary counseling and suggest that protective coatings or antioxidant surface modifications could enhance the clinical longevity of orthodontic appliances.