FROM FORAGE TO FUNCTION: CHEMICAL PROFILE AND REDOX AND ANTI-INFLAMMATORY EVALUATION OF ELEPHANT GRASS EXTRACTS

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Elephant grass (*Cenchrus purpureus*) is a highly valuable forage species, widely cultivated for its exceptional dry matter yield, nutritional quality, palatability, vigor, persistence, and versatile applications in animal feeding systems. This study aimed to investigate the anti-inflammatory potential of elephant grass extracts and correlate it with their free radical scavenging capacity through electrochemical and chemical profile analyses. The chemical profile of the extracts was obtained using LC-HRMS/MS with a Q-Exactive Orbitrap mass spectrometer operating in positive ESI mode. Data were processed using GNPS tools with integrated annotation strategies. Antioxidant activity was evaluated by voltammetry in triplicate, while anti-inflammatory effects were assessed through MTT-based cell viability and NO production in J774A.1 macrophages. Only the highest concentration (1:10 dilution) showed cytotoxicity, while all other tested concentrations maintained >70% viability. Extracts PCEC, T41.2, and T47.1 significantly reduced nitric oxide (NO) production at all tested dilutions (1:10–1:1000), whereas BRS, T12.9, T23.1, and THE10 were effective at 1:100 and 1:1000. CPU and T25.11 extracts inhibited NO only at 1:100. The voltammetric analysis revealed distinct antioxidant profiles among the elephant grass genotypes. Anodic peaks with Epa1 values ≤ 0.2 V, consistent with phenolic compounds, indicated high radical scavenging potential. Higher anodic peak intensities were observed for the PCEC and T231 samples, indicating a greater electron-donating capacity and, consequently, stronger antioxidant activity. The classical molecular networking analysis of the seven elephant grass genotypes revealed a total of 306 unique metabolites. The natural product pathways, 73 metabolites were associated with the shikimate and phenylpropanoid pathways, 40 with the fatty acid pathway, and 154 with the terpenoid pathway. Among the annotated compounds, 27 flavonoids were annotated, with 20 belonging to the flavone subclass. Additionally, chalcones and flavanones were detected. Of the total flavonoids, 25% were identified as aglycones and 75% as glycosides, primarily conjugated with glucose or rhamnose. Notable flavonoids included luteolin, swertisin, isovitexin, homoorientin, vitexin-2"-O-rhamnoside, chrysoeriol, tricin, isoschaftoside, and hesperidin. Other polyphenols that may contribute to the observed antioxidant activity were also annotated, including cinnamic acid derivatives such as *p*-coumaric acid, ferulic acid, and sinapic acid. The results highlight the promising antioxidant and anti-inflammatory properties of elephant grass, supported by electrochemical behavior and chemical composition.

Keywords: Forage crops, Polyphenols, Anti-inflammatory activity, Functional plants, Free radical scavenging