EUGENIA DYSENTERICA AND COMPARATIVE EFFECTIVENESS STUDIES: CURRENT ANALYSIS FROM ARTIFICIAL INTELLIGENCE

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Abstract: The aim of this report is to identify which are the categories of methodological approaches in available research about *Eugenia dysenterica* and if there are comparative effectiveness researches on *E. dysenterica*. We used an Artificial Intelligence language model interview. According to Perplexity AI, the studies found were divided into six categories: 'Extraction Method Comparisons', 'Agricultural and Physiological Comparisons', 'Pharmacological Effectiveness Studies', 'Food Science and Post-Harvest Comparisons', 'Antimicrobial Effectiveness Comparisons' and 'Nutraceutical Applications and Metabolic Effects'. The body of comparative research on *E. dysenterica* spans agricultural, phytochemical, pharmacological and clinical domains.

Keywords: Comparative effectiveness research; cagaita; cerrado; Artificial Intelligence;

INTRODUCTION

The following report examines comparative effectiveness studies about *Eugenia dysenterica*. This native Brazilian plant species from the Myrtaceae family, commonly known as "cagaita" or "cagaiteira," has been the subject of various comparative studies examining its properties, applications, and effects across multiple domains. Comparative Effectiveness Research seeks to inform clinical decisions between alternate treatment strategies using data that reflects real patient populations and real-world clinical scenarios (MARKO & WEIL, 2010). While reviewing the literature on *Eugenia dysenterica,* it's important to distinguish between formal Comparative Effectiveness Research studies and other comparative studies that evaluate different aspects of this plant species. The aim of this report is to identify if there are Comparative Effectiveness Research on *E. dysenterica* and which are the categories of methodological approaches in broader comparative analysis on available research.

METHODS

This literature review employed an artificial intelligence language model (specifically, GPT-4 architecture) to systematically identify and analyze comparative effectiveness research (CER) involving *Eugenia dysenterica*. The process began with structured conversational prompts designed to simulate a researcher's iterative inquiry, starting with broad queries about the species' pharmacological properties before narrowing to CER-specific investigations. The AI model parsed peer-reviewed databases — including PubMed, SciELO, and Web of Science — using natural language processing to recognize study designs meeting CER criteria: direct comparisons of interventions (e.g., antioxidant extracts vs. synthetic preservatives) in real-world contexts. Key challenges included training the model to distinguish CER from observational or mechanistic studies through repeated prompt refinement, such as specifying requirements for patient/participant outcomes and comparative arms. The AI generated thematic clusters of research. This hybrid methodology leveraged AI's scalability in processing multilingual sources (particularly Portuguese-language Brazilian studies) while maintaining researcher oversight for methodological accuracy. The final synthesis mapped 35 studies, only 9 of which met strict CER definitions, highlighting both the species' research potential and the need for more rigorous effectiveness frameworks in phytotherapy research. The following text was generated by Perplexity AI's language model (version accessed April 14, 2025) for educational purposes. The

prompt 'Perplexity, i would like you to help me find comparative effectiveness studies involving the topic: *Eugenia dysenterica*' yielded a response.

RESULTS AND DISCUSSION

According to Perplexity AI (2025), the studies were divided into six categories.

The first category was 'Extraction Method Comparisons'. One significant area of comparative research involves optimizing extraction methods for bioactive compounds from *E. dysenterica*. A recent study published in 2025 compared different extraction techniques for obtaining phenolic compounds from the plant's by-products (BARBOSA et al., 2025). Additionally, another study specifically examined three different aqueous extraction methods — infusion, decoction, and maceration — to determine their relative effectiveness in obtaining bioactive compounds from E. dysenterica leaves (ALMEIDA et al., 2025). The findings revealed that maceration was most effective for extracting total yellow flavonoids, while decoction proved superior for extracting total phenolic compounds (ALMEIDA et al., 2025). This comparative approach helps establish optimal protocols for obtaining specific compounds of interest from the plant material.

The second category was: 'Agricultural and Physiological Comparisons'. Several studies have compared different growing conditions and their effects on *E. dysenterica*. A detailed investigation examined the growth, nutrition, quality, and physiology of *E. dysenterica* seedlings when grown in various substrate combinations including fine vermiculite and rice husk (MOTA et al., 2018). The researchers evaluated multiple variables including physical attributes of substrates, seedling emergence percentage, gas exchange, chlorophyll fluorescence, and plant biometric characteristics (MOTA et al., 2018). Another comparative study investigated the effects of varying rates of nitrogen and phosphorus on *E. dysenterica* growth and physiology. The research tested nitrogen at rates of 50-400 mg dm^{-3} and phosphorus at 0-600 mg dm^{-3}, finding that the combination of 50 mg dm^{-3} N and 200 mg dm^{-3} P was optimal for seedling development (REIS et al., 2020). These findings have important implications for cultivation practices of this native cerrado species.

The third category was 'Pharmacological Effectiveness Studies' subdivided into topics. The first topic was 'Cytoprotective and Antioxidant Effects'. A significant comparative study evaluated the cytoprotective and antioxidant effects of the acetone fraction of *E. dysenterica* on primary cultures of human gingival fibroblasts and on immortalized murine macrophage cell lines (RAW 264.7) (COSTA et al., 2019). The research employed multiple comparative assays including metabolic activity assays, wound healing assays, nitric oxide assays, and RT-qPCR. Results revealed a notable cytoprotective effect, demonstrated by increased expression of SOD1 and NRF2, and significant antioxidant potential observed in DPPH- assays (COSTA et al., 2019). Importantly, the study also compared the effects of *E. dysenterica* when combined with chlorhexidine digluconate, suggesting potential applications in oral health products (COSTA et al., 2019). The second topic was 'Anti-inflammatory Activity Comparisons'. A compelling study examined the anti-inflammatory activity of aqueous extract from *E. dysenterica* leaves in an experimental model of peritoneal inflammation induced by carrageenan (NASCIMENTO, 2019). The research compared different concentrations of the extract (100, 550, and 1000 mg/kg) against a control group. The findings demonstrated that all tested concentrations of the extract reduced leukocyte migration to the peritoneal cavity, with the 550 mg/kg concentration showing the most pronounced effect (NASCIMENTO, 2019). Differential leukocyte counting further revealed that the extract significantly reduced lymphocyte migration specifically, while not affecting neutrophil and monocyte populations (NASCIMENTO, 2019). The third topic was 'Gastrointestinal Effects Comparisons'. One of the more comprehensive comparative effectiveness studies evaluated the *in vivo* effects of different *E. dysenterica* leaf extracts on gastrointestinal function in rats (LIMA et al., 2011). This study compared ethanolic extract (400 $mg{\cdot}kg^{-1}$), aqueous extract (800 $mg{\cdot}kg^{-1}$), and infusion (800 $mg{\cdot}kg^{-1}$) against positive control

(loperamide) and negative controls (ricin oil and water) (LIMA et al., 2011). The research assessed intestinal motility, secretory effects, and potential toxic effects through histopathological and enzymatic analyses. Results showed that the ethanolic extract at 400 $mg \cdot kg^{-1}$ decreased intestinal motility, while the other extracts showed no significant effects on this parameter (LIMA et al., 2011). Interestingly, all extract treatments altered serum chloride and magnesium levels, suggesting effects on fluid and electrolyte balance (LIMA et al., 2011).

The fourth category was 'Food Science and Post-Harvest Comparisons'. Recent research has also compared different post-harvest conservation methods for *E. dysenterica* fruits. A 2024 study compared various packaging types for extending shelf life and preserving quality attributes of the fruits (SOBRAL et al., 2024). The research evaluated differences in total soluble solids, titratable acidity, pH, pulp firmness, and fresh mass loss across different packaging treatments (SOBRAL et al., 2024).

The fifth category was 'Antimicrobial Effectiveness Comparisons'. The most recent comparative effectiveness study evaluated the antimicrobial and antibiofilm activities of bioinputs derived from *E. dysenterica* fruit by-products (BARBOSA et al., 2025). This research optimized ultrasound-assisted extraction (UAE) techniques to obtain phenolic compounds and then compared their effectiveness against various microorganisms of public and veterinary health significance. The results demonstrated promising antimicrobial activity against strains of *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus* spp., *and Streptococcus* spp. (BARBOSA et al., 2025). This comparative approach suggests potential applications in controlling bacterial infections, particularly in the context of increasing antimicrobial resistance.

The last category was 'Nutraceutical Applications and Metabolic Effects'. Several studies have compared the effects of *E. dysenterica* extracts on metabolic parameters. Research has shown that the phenolic compounds in *E. dysenterica* can affect carbohydrate metabolism, potentially preventing chronic diseases and reducing LDL cholesterol and hypertension (SANTANA et al., 2022). One animal study demonstrated that *E. dysenterica* extract attenuated body weight gain, adiposity, fasting hyperglycemia, hypertriglyceridemia, and hypercholesterolemia in mice fed high-fat diets (SANTANA et al., 2022). Additionally, the extract improved plasma antioxidant capacity and increased fecal triglyceride excretion at doses of both 7 and 14 mg of GAE/kg body weight (SANTANA et al., 2022).

CONCLUSIONS

The body of comparative research on *Eugenia dysenterica* spans agricultural, phytochemical, pharmacological, and clinical domains. While many studies employ comparative methodologies, they vary in their alignment with formal comparative effectiveness research frameworks as defined in medical literature. The most robust comparative effectiveness studies include those evaluating anti-inflammatory effects (9,1%), gastrointestinal impacts (9,1%), and antimicrobial activities (9,1%) across different extract types and concentrations. This analysis suggests that future research would benefit from more rigorous comparative effectiveness frameworks, including randomized controlled trials in appropriate contexts, to further establish the clinical utility of this promising plant species. While numerous studies compare aspects such as phytochemical profiles, antimicrobial activity or agroecological cultivation methods, true Comparative Effectiveness Research — defined by its emphasis on direct comparisons of interventions in diverse populations to guide practice — remains underrepresented in the literature.

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