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COMPARATIVE STUDY OF ANTIOXIDANTS AND POLYPHENOLS IN TWO AMARANTHUS SPECIES

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Abstract: Polyphenols and antioxidants are key bioactive compounds that protect against oxidative stress and support overall health. This study aimed to compare the polyphenol content and antioxidant activity of *Amaranthus retroflexus* and *Amaranthus caudatus* in different plant parts. Based on data synthesized from scientific literature, leaves showed higher total phenolic content and stronger antioxidant capacity than seeds. Among the two species, *A. caudatus* seeds contained notable phenolic levels, while *A. retroflexus* leaves exhibited superior antioxidant activity. These findings suggest that both species represent valuable natural sources of antioxidants and could be effectively used in functional foods and health-promoting applications.

Introduction

Members of the *Amaranthaceae* family, *Amaranthus caudatus* and *Amaranthus retroflexus* are edible plant species known for their rich content of bioactive compounds. These compounds play an essential role in protecting the human body against oxidative stress and in promoting metabolic and cellular health. *Amaranthus caudatus*, commonly known as "love-lies-bleeding," and *Amaranthus retroflexus* (redroot pigweed) are widely distributed in both temperate and tropical regions. Traditionally, *A. caudatus* is cultivated as a pseudocereal and ornamental plant, valued for its nutrient-rich seeds and high antioxidant potential. In contrast, *A. retroflexus* is often considered a wild species or weed, yet it also contains significant amounts of phenolic compounds, vitamins, and minerals. Both species have drawn scientific interest for their potential applications in nutrition, functional foods, and natural medicine due to their strong bioactive profiles.

Material and method

Data for this study were collected from scientific literature on the antioxidant and polyphenol profiles of *Amaranthus caudatus* and *Amaranthus retroflexus*. Values were grouped by analytical method and plant part, then processed using PAST software (v.2.17c). Descriptive statistics, normalization, and radar plots were used to compare the two species, revealing differences related to plant part and analysis technique.

Results and discussions

To meet the study objectives, data collected from scientific literature were organized into a comparative table (Table 1) and illustrated using graphical representations (Figures 1–2). The radar charts (Figure 1) illustrate the normalized values of antioxidant and phenolic parameters for both species. Each axis represents one of the measured indicators (TPC, ABTS, DPPH), scaled from 0 to 1. This normalization enables an easy visual comparison of patterns between the two species, regardless of the original measurement units or value ranges. The heatmap (Figure 2) displays antioxidant-related parameters (TPC, ABTS, DPPH) for various plant parts of *A. caudatus* and *A. retroflexus*, maintaining the original units of each assay. Since these analytical methods measure distinct biochemical properties on different scales, the heatmap emphasizes absolute differences in values, allowing direct comparison of actual antioxidant activity rather than relative differences within each method.

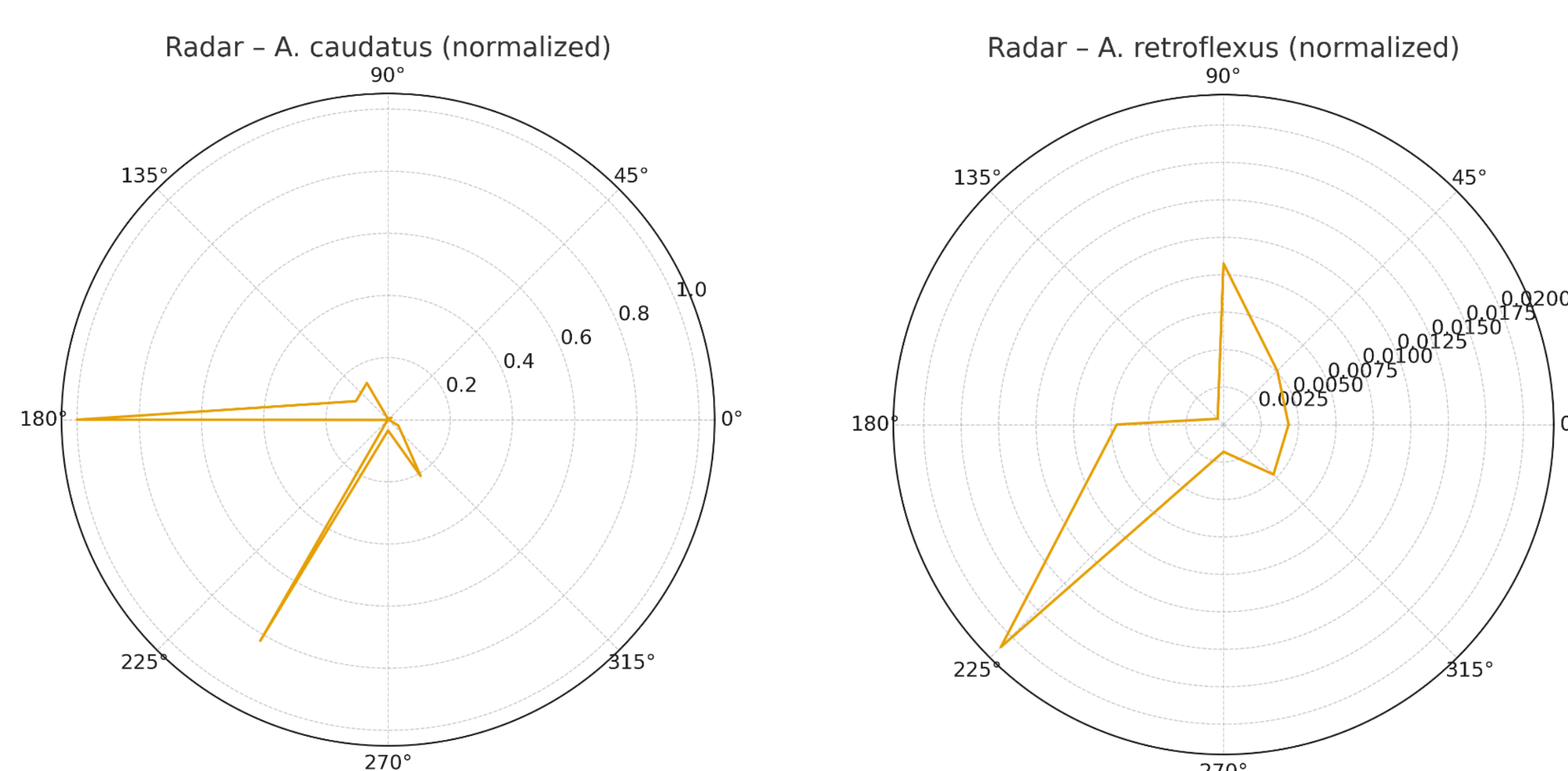


Figure 1. Radar chart: *Amaranthus caudatus* versus *Amaranthus retroflexus*

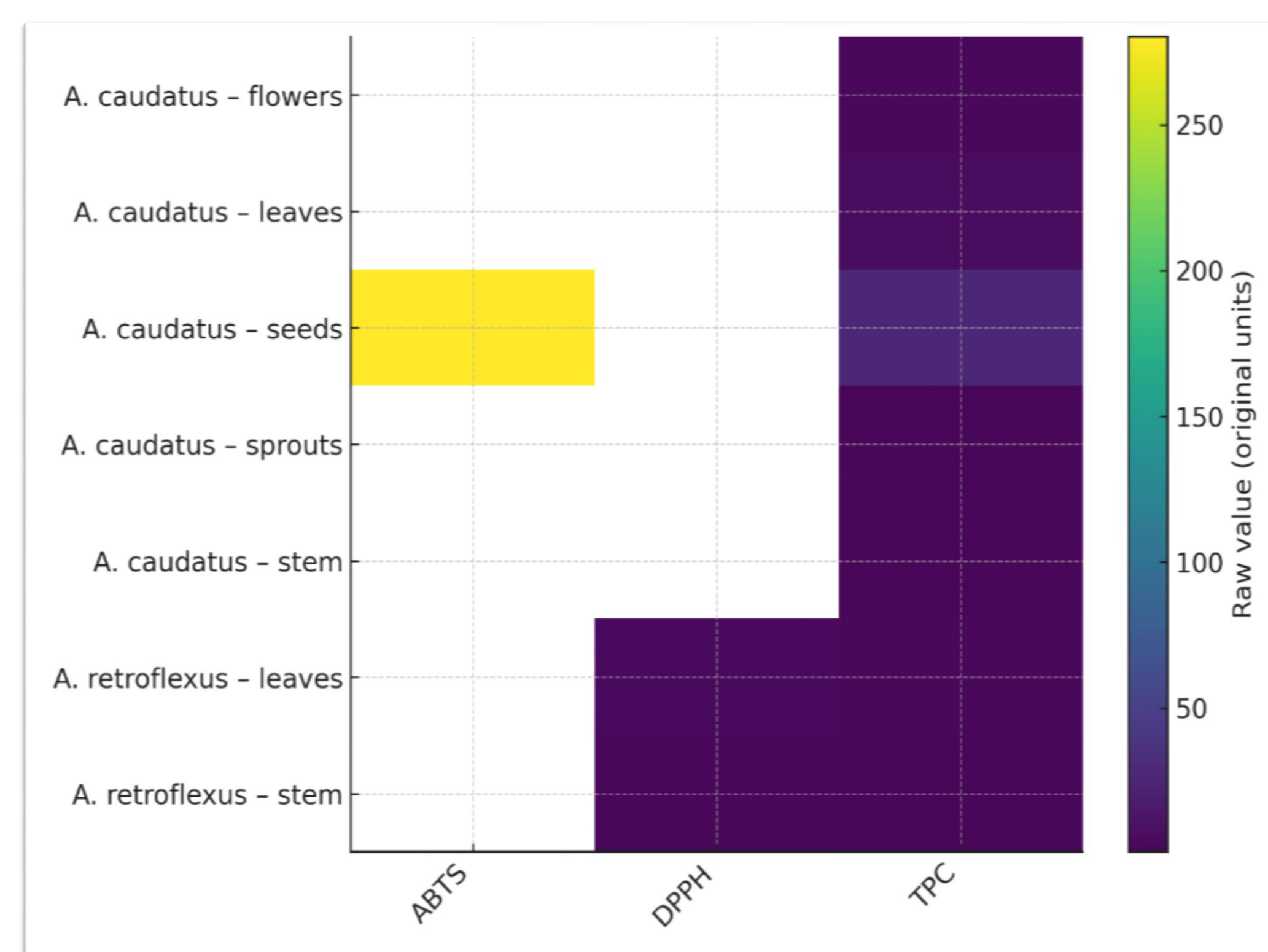


Figure 2. Heatmap of Raw Data separated by method

Conclusions

Although *Amaranthus retroflexus* contains lower levels of antioxidants than *Amaranthus caudatus*, it is a more practical option for routine or large-scale use. Its status as a hardy, fast-growing weed makes it willingly available, cost-free, and easy to harvest, with minimal environmental impact when collected. In contrast, *A. caudatus*, despite its higher antioxidant content and potential for high-value extracts, requires deliberate cultivation and management, which limits its feasibility for extensive use. Therefore, *A. retroflexus* offers clear advantages in terms of accessibility and sustainability, even if its biochemical potency is lower.

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