



FULL ARTICLE

Effect of long-term storage on phenolic composition, antioxidant capacity, and protein profiles of *Calicotome villosa* subsp. *intermedia* seeds

Fayçal Boughalleb¹ | Maher Mahmoudi^{1,2} | Raoudha Abdellaoui¹ | Boutheina Yahia¹ | Slah Zaidi³ | Nizar Nasri²

¹Laboratoire des Ecosystèmes Pastoraux et Valorisation des Plantes Spontanées et des micro-organismes associés, Institut des Régions Arides, Université de Gabes, Médenine, Tunisia

²Faculté des Sciences de Tunis, Université de Tunis El-Manar, Tunis, Tunisia

³Laboratoire Central, Institut des Régions Arides, Université De Gabes, Médenine, Tunisia

Correspondence

Nizar Nasri, Faculté des Sciences de Tunis, Université de Tunis El-Manar, Tunis 2092, Tunisia.

Email: nizar.nasri@fst.rnu.tn

Funding information

Ministry of Higher Education and Scientific Research

Abstract

Phytochemicals from *Calicotome villosa* seeds were evaluated during long-term storage. Total phenols were affected during storage, ranging from 34.6 (5-years-aged seeds) to 45.1 mg GAE/g DW (16-years-aged seeds). Flavonoids increased with the storage period varying from 21.4 (seeds collected at 2013) to 34.1 mg QRE/g DW (seeds collected at 2002). The total condensed tannins were low for all storage periods and the highest value was registered for 16-years-aged seeds (0.15 ± 0.01 CTE/g DW). LC-ESI/MS analysis showed five phenolic acids and 11 flavonoids, which remained steady during the long-term storage. High-maintained storage protein content (50.2% DW) occurred in *C. villosa* seeds even under long-term storage (up to 16 years). Globulins were the major proteins (47.6% of total proteins). All these findings made *C. villosa* a source of natural antioxidants with high industrial value and could be used as a potential food source.

Practical applications

In this research paper, we have evaluated and discussed the effect of long storage duration (5, 10, 13, and 16 years) on phenolic contents, antioxidant potential, and protein profiles of *C. villosa* seeds. The total phenolic content determined was not affected by storage duration, while the values of flavonoid content were enhanced. The storage length significantly increased the total condensed tannin content. However, the phenolic acids and flavonoid compounds remained stable. Moreover, high-maintained storage protein content (globulins, albumins, glutelins, and globulin) occurs in *C. villosa* seeds even under long-term storage. The obtained results showed that the quality of the seeds was not negatively affected by long storage duration. *C. villosa* seeds show the prospective potential applications in the food industry.

KEYWORDS

antioxidants, *C. villosa* seeds, long-term effect, storage proteins

1 | INTRODUCTION

The high growth rate of human populations especially in underdeveloped countries has increased protein and fats' requirements, which give natural vegetable products, such as protein, phenolic

compounds, and oil, a great interest as natural antioxidants and safe supplements for human diet. Among vegetable foods, legume seeds that are generally rich in protein and phenolic compounds can be involved in human diet safety and for the prevention of many health-related conditions (Muzquiz et al., 2012).