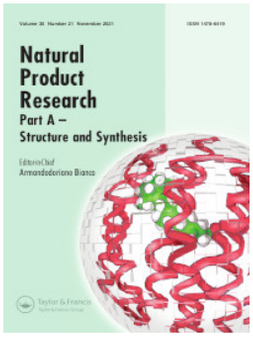

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SHORT COMMUNICATION

Chemical characterization by GC/MS analysis of *Lactuca tatarica* (L.) C.A.Mey. aerial parts and seeds

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ABSTRACT

Lactuca tatarica is a wild species belonging to Asteraceae family omnipresent in Southern Caucasus region including Azerbaijan. Previous studies on the chemical content of some extracts obtained from its different organs have reported the presence of lactone sesquiterpenes, triterpenoids and flavonoids. For the first time, we investigated the volatile composition of *L. tatarica* aerial parts and seeds by GC/MS technique. The results showed the predominant presence of fatty acids, both saturated and unsaturated. Palmitic acid was prevalent in the aerial parts (up to 89.9%) while linoleic acid (up to 82.6%) was the most abundant component in the seeds. Other minor components were terpene and hydrocarbon derivatives. Some of the detected constituents in *L. tatarica* have already demonstrated antibacterial, antifungal, anti-inflammatory and antioxidant activity. Therefore, this species could be better studied for its biological properties and considered as a source of active ingredients useful in various fields including the pharmaceutical one.

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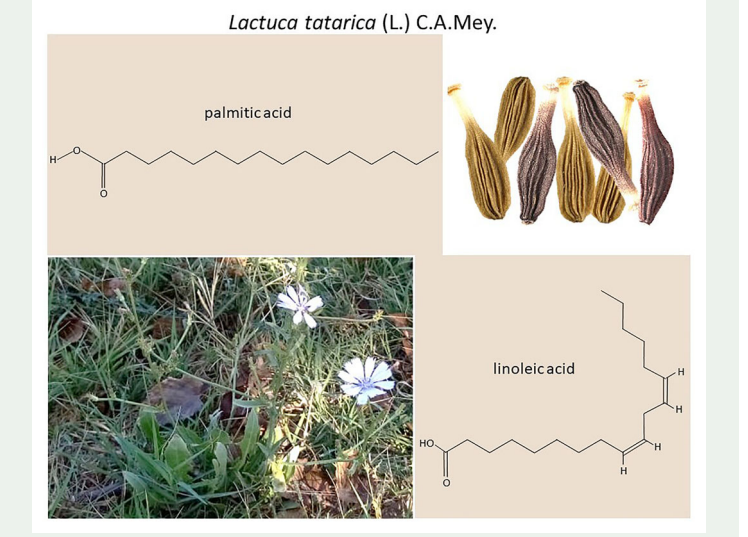

1. Introduction

The geographical distribution of the genus *Lactuca* (Asteraceae) in Caucasus includes 15 species, which drop to 10 in Azerbaijani flora (Askerova et al. 1961). Among these, *L. tatarica* (L.) C.A.Mey. is a subglabrous perennial plant growing on seashores, river-banks, and as a weed or ruderal. It is characterized by vertical rhizomes and underground stolons, stem 30-100 cm high, erect, branched above. The lower leaves are runcinate-pinnatifid and shortly petiolate while the upper ones lanceolate, sessile and semiamplexicaul. The inflorescence consists of capitula with 16-23 florets and lilac-blue ligules. The fruits are 4-6 mm long achenes, yellowish to black (Tutin et al. 1993). In some Asian countries, the leaves of *L. tatarica* are traditionally used in folk medicine against headache, fever, internal wounds and vomiting while the decoction of the whole plant is prepared to treat joint pains or other ailments including abdominal distension, appendicitis, blood extravasation, leucorrhea and skin bacterial infection (erysipelas) (Wu 1990; Angmo et al. 2012; Devi et al. 2013; Namtak and Sharma 2018). Nevertheless, few works documented the bioactivity of *L. tatarica*. It has been investigated for its antibacterial, antioxidant, antiviral and cytotoxic properties (Wang et al. 2006; Zhou et al. 2011; Gao et al. 2012; Jing et al. 2012). Different studies have reported the chemical characterization of some extracts or their fractions obtained from roots, aerial parts or whole plant of *L. tatarica*. As in other *Lactuca* species (Michalska et al. 2021), sequiterpene lactones are the predominantly found compounds followed by triterpenoids and flavonoids isolated and identified by different techniques (Akyev et al. 1990; Kisiel et al. 1997; Kisiel and Barszcz 1998; Wang et al. 2006; Michalska et al. 2009; Wang et al. 2010; Kisiel 2014). This is the first work aimed at investigating the chemical volatile content of *L. tatarica* seeds, as well as its aerial parts, by GC/MS analysis.

2. Results and discussion

The compounds detected in the petroleum ether (PET), dichloromethane (DCM) and methanol (MeOH) extracts obtained from aerial parts and seeds of *L. tatarica* collected in the Shabran District of Azerbaijan and analyzed by GC-MS technique are listed in Table S1. A total of 35 molecules belonging to different chemical classes were identified. In general, seeds were characterized by a greater number of compounds (27) than aerial parts (17) and the fatty acids were predominant with values ranging from 81.1% to 94.0% and from 74.9% to 89.9%, respectively. For both plant organs, the PET extract was the richest in compounds (20 and 12) followed by the MeOH extract (12 and 6) and the DCM extract (5 and 4). In all three seed extracts, linoleic and palmitic acids were the most abundant constituents (58.7% to 82.6% and 8.2% to 22.4%, respectively). Similarly, MeOH extract of the aerial parts showed a content of 46.7% linoleic acid and 28.2% palmitic acid. The opposite trend was found for their PET sample with 52.6% palmitic acid and 16.5% linoleic acid while DCM extract was characterized by 89.9% palmitic acid. Other fatty acids such as dodecanoic acid, linoelaidic acid, oleic acid and tetradecanoic acid were identified as minor compounds ($< 4.0\%$). To the best of our knowledge, the fatty acid profile of *L. tatarica* has never been reported before, unlike other *Lactuca* species. The occurrence of some fatty acids including palmitic and linoleic acids was previously specified in *L. sativa* (Kim et al. 2016) and in *L. canadiensis* (Liberal et al. 2021), where α-linolenic, absent in our samples, was also detected as a major compound. In these lettuces, the polyunsaturated fatty acids constituted the largest group as well as in seed extracts of *L. tatarica* and partially in its aerial part extracts.

Among the other compounds determined in *L. tatarica* and present in appreciable quantities, there are some linked to the *Lactuca* genus for the first time. For example, this is the case of the sesquiterpenoid hexaydrofarnesyl acetone (8.1%) in the PET extract of the aerial parts or of the branched hydrocarbon 2-methyl tetracosane (14.9%) in the seed DCM extract. Another sesquiterpenoid, neophytadiene (8.0%), was recently traced in the PET extract of the *L. sativa* leaves (Mughrbi and Auzi 2020). The seed PET extract was also characterized by some minor compounds belonging to the family of terpenes such as linalool (0.1%), p-menthone (0.1%), citronellol (0.8%), cis-geraniol (0.2%) and γ-eudesmol (0.1%). Among these molecules, only citronellol was also found in the seed MeOH extract (0.4%). Furthermore, in our investigation, 2-methoxy-4-vinylphenol (15.4%) in the aerial parts MeOH extract was revealed. This compound, previously identified in the DCM extract of red cabbage and isolated from pine needles, showed high antimicrobial power (Rubab et al. 2020) and anti-inflammatory effect (Jeong et al. 2011).

Based on the literature, the bioactivity of some fatty acids found in *L. tatarica* has already been documented. These molecules are known to have been effectively tested for different abilities including antibacterial, antifungal, anti-inflammatory, antioxidant properties (Dilika et al. 2000; Ceyhan-Güvensen and Keskin 2016; Elagbar et al. 2016; Abd-ElGawad et al. 2019; Adnan et al. 2019).

3. Experimental

Supplementary material related to this paper is available online.

4. Conclusions

In this work, the chemical investigation of *L. tatarica* aerial part and seed extracts was performed using GC/MS technique. According to the literature information, the state of knowledge on this species shows some gaps. Obtained results, together with the previous data, could support further studies, including those on its biological properties, useful for a possible enhancement of this plant as a source of active substances for the pharmaceutical, food and cosmetic fields or other sectors. Many of the constituents present in *L. tatarica* have proven activities characterizing different traditional remedies.

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