Phytochemical studies of Some Terpene compounds in roots of *Cynara scolymus*

Alireza Shakeri*1* and Mahsa Ahmadian2

1. School of chemistry, University College of science, University of Tehran, P.O. Box 13145-1357, Tehran, Iran
2. Department of Chemistry, university of Golestan, Gorgan, IRAN

Corresponding author: Alireza Shakeri

**ABSTRACT:** Artichoke (*cynara scolymus*) belongs to Asturaceae family. It is native to the central Mediterranean, but now cultivated in many parts of the world. This plant has different therapeutic properties, including anti-cancer. The purpose of this investigation was clarify some new terpene compounds from the root *Cynara scolymus*. Two terpenes have been isolated from the hydrocarbon fraction of Cynara scolymus essential oil using column chromatography. The structure formulae of the compounds Taraxasterol and Lupeol were determined using one and two dimensional 1H NMR and 13C-NMR spectroscopic.

**Keywords:** Artichoke, Terpene compounds, Taraxastero, Lupeol, NMR spectroscopy

**INTRODUCTION**

Artichoke (*Cynara scolymus L*.), a plant from the family Asteraceae, is cultivated in the Mediterranean zone for the consumption of its flower bud (Mencarelli et al. 1993). Apart from being consumed as fresh and canned vegetables, artichokes are traditionally used as a medicinal plant (Schütz et al. 2006). Globe artichoke (*Cynara cardunculus L. subsp. scolymus L*.), belonging to the Asteraceae (Compositae) family, is an herbaceous perennial plant native to the Mediterranean area (Raccuia, 2005), where about 90% of world production is found with million tons on 133,326 Ha (Faostat, 2009). Several uses such as (i) human food as a typical component of the Mediterranean diet, (ii) lignocellulosic biomass for energy (Angelini et al. 2009; Ierna and Mauromicale, 2010) and paper pulp (Gominho et al. 2001), (iii) seed oil for biodiesel fuel production (Raccuia and Melilli 2004), (iv) roots for insulin (Raccuia and Melilli 2004,) are considered for the species. Plant steroids are among the most basic components of natural vegetation to have therapeutic uses (Gonella 2003). Research as shown that many herbal steroids such as Lupeol and Taraxasterol has two important properties such as inhibition of tumor growth and help regulate blood cholesterol in humans. Lupeol, a triterpene, which may help slow the growth of cancer cells. Studies have shown that Lupeol specific pharmacological properties including anti-inflammatory properties. Taraxasterol, A monohydroxy triterpene. In this study, we describe the isolation of some terpene from the root parts of *Cynara scolymus* as well as the elucidation of their structures using spectroscopic analysis.

**MATERIALS AND METHODS**

**Spectroscopic measurements**

One dimensional (1D) NMR (1H NMR and 13CNMR, DEPT 90) and two dimensional (2D) NMR spectra were recorded in deuterated solvent MeOD on Burker AM-400 MHz spectrometer. Chemical shifts were measured in ppm and coupling constants (J) are given in Hz. UV spectrum was recorded on UNICAM – UV300 spectrophotometer. Column chromatography was carried out using silica gel 60 Merck, 230-400 mesh). Thin layer chromatography (TLC) was done on silica gel 60 F254 plates.
The root *Cynara scolymus* were collected during flowering stage in Jun (2012) in the Plants Garden in University of Agricultural Sciences and Natural Resources, Gorgan, IRAN. The plant roots were immediately rinsed of debris and shade-dried for one week on laboratory trays. The dried root was powdered and weighed. 750 grams of ground root, at room temperature with 80% methanol was extracted for 48 hours using the percolation method. The resulting extract concentrated by rotary evaporator and then dried. The obtained extract was suspended in 500 ml of water when and then with 500 ml of hexane solvent in the first step of the two-phase state was placed. The second and final stage of chloroform solvent with ethyl acetate was placed in a two-phase mode. After performing these steps, extracts of hexane, chloroform and ethyl acetate were concentrated by rotary – evaporator. Extract obtained with weight 2.77g was normal-phase silica gel column chromatography. To separate terpene compounds of chloroform extraction in *Cynara scolymus* column chromatography was used and gradient elution technique was applied, using two organic solvents hexane: ethyl acetate in fractions of 100 ml and 20)(C21), 34.07 (C28), 18.93 (C6), 19.49 (C28), 21.45 (C11), 25.50 (C29), 25.63 (C21), 26.19 (C12), 26.66 (C15), 27.41 (C2-2), 27.99 (C23), 33.35 (C-7), 34.07 (C-17), 36.72 (C-10), 37.14 (C-4), 38.31 (C-16), 38.59 (C-1) 39.18 (C-13), 39.38 (C-19), 41.54 (C-8), 42.19 (C-14), 48.6 (C-18), 50.50 (C-9), 55.37 (C-5), 79.01 (C-3), 107.15 (C-30), 154.63 (C-20).

**RESULTS AND DISCUSSION**

The 1H and 13C NMR data (δ, ppm) of the isolated compounds 1-2 from extracts of *Cynara scolymus* are given below:

**Taraxasterol (1).**

1H NMR (CD3OD, 400 MHz): δ 0.699 (3H, s, H-24), 0.863 (3H, s, H-23), 0.884 (3H, s, H-28), 0.901 (3H, s, H-25), 0.928 (3H, s, H-27), 0.941 (3H, s, H-26), 0.954 (3H, d, J= 2.8 Hz, H-29), 3.141 (1H, m, H-3), 4.54 (2H, dd, J= 2, 4.8 Hz, H-30). 13CNMR (CD3OD, 400 MHz): δ 14.77 (C-27), 15.39 (C-26), 15.90 (C-25), 16.28 (C-24), 18.31 (C-6), 19.49 (C-28), 21.46 (C-11), 25.50 (C-29), 25.63 (C-21), 26.19 (C-12), 26.66 (C-15), 27.41 (C-2), 27.99 (C-23), 33.35 (C-7), 34.07 (C-17), 36.72 (C-10), 37.14 (C-4), 38.31 (C-16), 38.59 (C-1) 39.18 (C-13), 39.38 (C-19), 41.54 (C-8), 42.19 (C-14), 48.6 (C-18), 50.50 (C-9), 55.37 (C-5), 79.01 (C-3), 107.15 (C-30), 154.63 (C-20).

**Lupeol (2).**

1H NMR (CD3OD, 400 MHz): δ 0.792 (3H, s, H-23), 0.816 (3H, s, H-24), 0.876 (3H, s, H-25), 0.956 (3H, s, H-26), 0.995 (3H, s, H-27), 1.068 (3H, s, H-28), 1.7 (3H, s, H-30), 3.228 (1H, dd, J= 4.8, 11.2 Hz, H-3), 4.634 (2H, dd, J= 2, 4.8 Hz, H-29). 13CNMR (CD3OD, 400 MHz): δ 14.77 (C-27), 15.38 (C-24), 15.89 (C-26), 16.28 (C-25), 18.30 (C-28), 18.93 (C-6), 19.49 (C-30), 21.45 (C-11), 25.50 (C-12), 26.66 (C-15), 27.41 (C-2), 27.98 (C-23), 29.70 (C-21), 34.07 (C-7), 35.05 (C-16), 37.14 (C-10), 38.31 (C-13), 38.77 (C-1), 38.88 (C-4), 39.18 (C-22), 39.38 (C-8), 42.19 (C-14), 42.73 (C-17), 47.64 (C-19), 48.66 (C-18), 50.50 (C-9), 55.37 (C-5), 79.01 (C-3), 107.14 (C-29), 154.66 (C-20).
From the roots of *Cynara scolymus* two terpenes were isolated and identified as Taraxasterol (1) and Lupeol(2), based on the spectroscopic spectra (1H NMR, 13C NMR) compared to the known standard compounds with reported in the literature. To our best of knowledge, this is the first report on the isolation and structural elucidation of these compounds from the roots of *Cynara scolymus*. As shown in the literature, anti-inflammatory, antimicrobial and antihyperlipidemic activities effect of Taraxasterol and Lupeol has been reported on various cancer cells.

In conclusion, the results of this paper show that the main terpenes of the root *Cynara scolymus* are biologically and pharmacologically active Taraxasterol and Lupeol . The results indicated that there has not found any diterpene as the main compound in the root of *Cynara scolymus*.

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<th>Solvent</th>
<th>Fraction</th>
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<td>Ethyl acetate : Hexane 8 : 2</td>
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REFERENCES


