

Hepatoprotective effects of artichoke (*Cynara scolymus*)

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Abstract

Artichoke has been used in traditional medicine for centuries as a specific liver and gallbladder remedy. The active ingredient in artichoke is cynarin which is found in highest concentrations in the leaves. Like silymarin, cynarin has demonstrated significant liver protecting and regenerating effects.

Key Words: Artichoke, Hepatoprotective, effect.

Enginar (*Cynara Scolymus*)'ın karaciğer koruyucu etkisi

Özet

Enginar, geleneksel tıpta yüzyıllar boyunca spesifik bir karaciğer ve safra kesesi ilacı olarak kullanılmıştır. Enginarın aktif maddesi sinarindir ve en fazla bulunduğu yer yapraklarıdır. Sinarinde, silymarine benzer şekilde karaciğeri koruyucu ve yenileyici etkiler göstermiştir.

Anahtar Kelimeler: Enginar, karaciğer koruyucu, etki.

Introduction

Constituents of the flower heads are 12% sugar (inulin), 3% protein, tannin, cynarin, vitamins A, B1, B2, B3, C, caffeic acid, flavonoids (rutin), and sesquiterpenes lactones (Hänsel, 1992).

Although the most important active compound of *Cynara scolymus* L., cynarin, is present in the whole plant, the major concentration is found in the leaves. For this

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reason, most of the natural medicines obtained from this plant are prepared from leaves. Cynarin is found in the whole plant and besides is considered one of the main active chemical compounds. Technically, cynarin is a caffeolquinic acid and concentrates in major degree in the leaves (Speroni, 2003).

Cynarin is a phenolic acid compound that experts believe is responsible for its cholagogue and choleric properties. These two functions are extremely important to the liver's well-being. This is because, if the bile is not transported adequately to the gallbladder, the liver has an increased risk of being damaged.

Results and Discussion

The Mechanisms of Action

Artichoke leaves represent a natural source of phenolic acids with dicaffeoylquinic acids, such as cynarin (1,3-dicaffeoylquinic acid), along with its biosynthetic precursor chlorogenic acid (5-caffeoylquinic acid) as the most abundant molecules. *Cynara scolymus* leaves extracts have long been used in folk medicine for their choleric and hepatoprotective activities, that are often related to the cynarin content. These therapeutic properties are also attributed to mono- and di-caffeoylquinic acids and since commercial *C. scolymus* preparations can differ for their activities, we studied four extracts to evaluate, if present, a relationship between the hepatobiliary properties of the different preparations and their content in phenolics. (Moglia et al., 2008).

When toxins enter the body from the environment they are either stored in tissues or transported to the liver. In the liver, a complex assortment of enzymes attempts to neutralize and excrete them as bile salts. Detoxification programs often stimulate the mobilization of stored toxins into the blood in which they are then transported to the liver. Bile-stimulating compounds like cynarin then facilitate a quicker elimination of toxin-laden bile into the digestive tract where it can be eliminated in the feces (Kewensis, 2002).

The hepatoprotective activity of cynarin against carbon tetrachloride (CCl₄)-induced toxicity in isolated rat hepatocytes was compared with other phenolic compounds. Only cynarin and, to a lesser extent, caffeic acid showed a cytoprotective effect (Adzet, 1987).

Artichoke possesses potent diuretic and hepatostimulating properties. Several *in vitro* and *in vivo* studies have revealed about antioxidative and hepatoprotective properties of Globe Artichoke leaves' extracts and their active components, against hepatic cell damage caused due to various hepatotoxins. The hepatoprotective effects of polyphenolic compounds from *Cynara scolymus* against CCl₄ toxicity in isolated rat hepatocytes is backed by laboratory trials (Gebhardt, 2002).

The hepatoprotective activity against CCl₄ toxicity in isolated rat hepatocytes (an experimental model widely used to mimic several aspects related to liver pathology characterized by increased lipid peroxidation and cytotoxicity due to oxidative stress) of some polyphenolic compounds, such as cynarin, isochlorogenic acid, chlorogenic acid, luteolin-7-Oglucoside, and two organic acids (caffeic and quinic) from *C. scolymus* has been reported (Preziosi, 1969).

Gebhardt and Fausel (1997) show that aqueous artichoke extracts reduce lipid peroxidation (measured as production of malondialdehyde) and cytotoxicity (measured as lactate dehydrogenase leakage) in cultures of rat primary hepatocytes exposed to tert-butyl hydroperoxide (t-BHP). Furthermore, artichoke extracts prevented the corresponding loss of intracellular glutathione caused by t-BHP, which in turn induces lipid peroxidation.

Among different antioxidant enzymes measured (superoxide dismutase, glutathione peroxidase, glutathione reductase, and catalase) in erythrocytes, only glutathione peroxidase activity was elevated in the artichoke group compared to the control group. 2-Amino adipic semialdehyde, a protein oxidation biomarker, was decreased in plasma proteins and hemoglobin in the artichoke-fed group versus the control group. In conclusion, the *in vitro* protective activity of artichoke was confirmed in a rat model (Jiménez-Escrig et al., 2003).

Artichoke extracts and some of their pure phenolic constituents were assessed for their protective role in the control of oxidative damage to biological molecules (proteins, lipids and DNA), caused by free radicals such as $\text{RCOO}\cdot$ and/or $\text{OH}\cdot$, and the mechanism of their action using the β -carotene/linoleate assay, the deoxyribose assay and the metmyoglobin assay (Lattanzio et al., 2005).

Conclusion

Leaf extracts have been reported to show antioxidative and protective properties against hydroperoxide-induced oxidative stress in cultured rat hepatocytes, to protect lipoprotein from oxidation in vitro, to inhibit hemolysis induced by hydrogen peroxide, and to inhibit oxidative stress when human cells are stimulated with agents that generate reactive oxygen species such as hydrogen peroxide (Lattanzio et al., 2009).

Artichoke had a marked antioxidative potential that protects hepatocytes from an oxidative stress. Furthermore, AE reduced cell viability and had an apoptotic activity on a human liver cancer cell line (Miccadeia, 2008).

In vitro and vivo studies involving human and animal models have substantiated the protective and regenerative effects of cynarin on the liver.

Artichoke leaf extract significantly prevented oxidative damage to hepatocyte membranes exposed to tertiary butyl hydroperoxide (t-BHP) and that chlorogenic acid and cynarin were the main contributors to this strong antioxidant effect.

The main actions of artichoke's pharmacology are: liver and gallbladder bile stimulation, hepatoprotective (liver protector), antihepatotoxic (liver detoxifier) and hypocholesterolemic (lower cholesterol).

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