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Quantitative analysis of quercetin in different parts of *Capparis spinosa* by HPLC

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ABSRACT

Quercetin is a plant derived flavonoid, specifically a flavone which is found in high amount in onion, caper, red wine and green tea.It is one of the most active antioxidants because of its high ability to scavenge free radicals.In this study the content of quercetin was quantitatively determined in different plant parts ofC.spinosa at the mature fruiting stage, using HPLC analysis.Collection of plant materials were made from Tafresh,Iran. Plants were separated into root,stem, leaf, floral bud,flower,fresh fruit and seed which were dried at an ambient room and subsequently assayed for total quercetin contents.The content of quercetin varied from 1.7 mg/g to 12.8 mg/g among different parts of caper. Flower, floral bud and fruit had higher content of quercetin respectively. The significant amounts of these antioxidants confirm the nutritional and medicinal value of caper.

Key words: Caper, quercetin, medicinal usage, nutritional value

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INTRODUCTION

Quercetin,part of a subclass of flavonoids called flavonols ,has received considerable attention because of its beneficial impact on health.Its biochemical activity is well documented.It is one of the most potent antioxidants among polyphenols [4][15][19].Quercetin has also been to demonstrated to display the antiviral, antibacterial, anticarcinogenic and anti-inflammatory effects [3][4][6].Also is considered to be a strong antioxidant due to its ability to scavenge free radicals and bind transition metal ions. These properties of quercetin allow it to inhibit lipid peroxidation[7][21].Its structural formula is presented in Fig1.

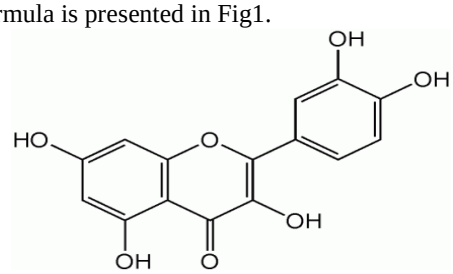

Fig.1:Structure of quercetin

Quercetin is mainly found in many often consumed foods include green apple, onion, green tea, lemon as well as many seeds, flowers, barks, and leaves[8].It is also found in medicinal botanicals plant such as *Solanum Trilobatum*,

Hypericum perforatum, *Ginkgo biloba* and in many other[14].Also *C. spinosa* is one of the rich source of quercetin[25].

Capparis spinosa L.(Capparidaceae),a winter deciduous species, is one of thefew perennial shrubs that grow and flower entirelyduringsummer [23]. Fermented capers fruits are often served as an appetizer with meat, olives, cheese and nuts, or as a complement to salads, pasta, and other foods [9].

The caper plant metabolizes a large number of secondary metabolites mainly flavonoids, alkaloids, glycosides, organic acids and glucosinates [2]. The seeds are rich in protein, lipids and fiber with a high content of palmitic, oleic, linoleic, stearic, lauric, myristic and linoleic acids [2][10][24].

This paper focuses on quercetin content in different parts of caper plant at the mature fruiting stage.

MATERIALS AND METHODS

2.1. Reagents and materials

2.1.1 Reagents and chemicals

Methanol and acetic acid were of HPLC grade and were purchased from Merck Company.Deionized water was prepared by a Milli-Q Water Purification system.Quercetin standard were purchased from Sigma Company.

2.1.2 Plant materials

Caper plants were collected from Tafresh, Iran, inJuly at the mature fruiting stage of plant development. Collections were done in these populations by a randomized collection of 10 individual within maturity stage.After collection, plants were separated into root, stem, leaf, floral bud, flower, fruit and seed. The plant materials were dried in shade separately.

2.2Preparation of sample solution

An amount of 0.1-0.5 g of ground plant material was extracted with 10 ml of solution (methanol-acetic acid- water 100:2:100) for 1 hour on a shaker at laboratory temperature. 2 ml of the extract were centrifuged for 10 min at 2000 rot/min.Then solution was filtered through a micro filter with a regenerated cellulose membranes of the pore size 0.22 .The filtrate was applied for HPLC. Detection with UV detector was carried out at 368 nm. Retention time for quercetin was 9.82 min and the peak area of the sample was compared to the standard.

2.3 Preparation of standard solutions

Standard stock solutions of quercetin were prepared in ethanol, at concentration of 1,5,10 and15 ppm.All sample solutions were filtered through 0.22 µm membrane filter and injected directly.

*2.4*HPLC condition

Chromatographic analysis was carried out by using C18 column (4.6mm × 250mm)as the stationary phase and methanol: acetonitrile: water(10:10:75) containing 5% acetic acid as the mobile phase.Flow rate and injection volume were 1.0 ml/min and 10 µm respectively.The chromatographic peaks of the analytics were confirmed by comparing their retention time and UV spectra with those of the reference standards.All chromatographic operations were carried out at ambient temperature.

RESULTS AND DISCUSSION

Table 1:Quercetin content in different parts of caper

Plant Parts	Quercetincontent(mg/g)
Root	1.7
Stem	5
Leaf	7.92
Floral bud	10
Flower	12.8
Fruit	9.6
Seed	6.2

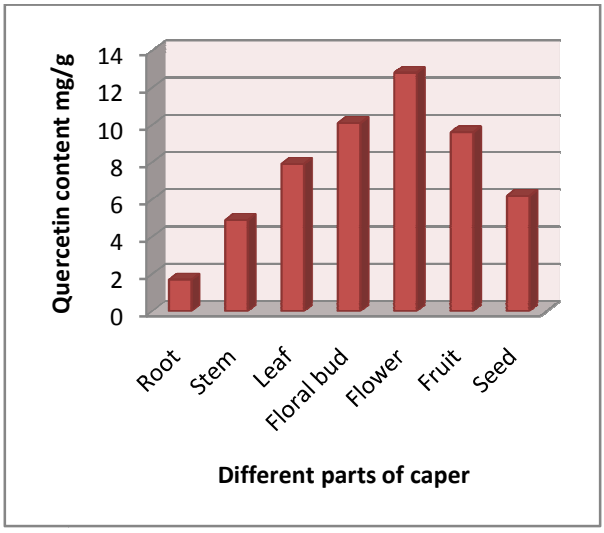

Figure 2:Quercetin fluctuation in different parts of caper plant

There were significant differences among different parts of plant in regard to their quercetin content.The mean for quercetin content in different plant parts is given in (table 1). It is apparent that flowers contain the highest quercetin content.Quercetin content values ranged from 1.7 mg/g for root to 12.8 mg/g in the flowers (figure2).

Similar to primary metabolites tissue-dependence of secondary metabolites is very common among medicinal plants[1].previous study reported highest amount of flavonoid (rutin) in the leaves of *C.spinosa*[11][12][17].Highest amount of total phenols was observed in the leaves of *Hypericum* species[1] and similar findings were reported [16][26].so changing the amount of flavonoid of quercetin in different organs of caper plant in this research is similar to mentioned researches.

It is believed thatflavonoids production in different organs in plant may change by enzymes activity[13] and hormones such as cytokinin and gibberellic acid could be active a few flavonoids production enzymes[22] and other researchers with the usage of cytokinin increased the amount of flavonoids in unripe fruits[20].Leaves and flowers generally contain greater levels of phenolic acids and terpenoids than stems and roots[5].

The results of this research showed that quercetin is one of the important components of this plant, and some of its pharmacological effects could be attributed to the presence of this constituent.

CONCLUSION

It can be concluded that there is a close relationship between quercetin content and plant tissue.Considering the pharmacological significance of quercetin, their possible use in therapeutics and the growing interest in analytical data on natural quercetin in plants it is important to find the different sources of this compound. At this point, quercetin content in caper plant especially in Iran encourages the cultivation, and other biological evaluation of this plant in this country.

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