



QUALITATIVE AND QUANTITATIVE ESTIMATION OF PHENOLIC COMPOUNDS OF LEAVES AND STEMS FOR SOME HERBAL PLANTS AT AL-GABAL AL-AKHDER REGION

Hamad M Idres Hasan¹, Mariea Farage EL-Mehdawy² and Eman K Saad^{1*}

¹Chemistry Department, Sciences Faculty, Omar AL-Mukhtar University, Libya.

²Chemistry Department, Sciences Faculty, Benghazi University, Libya.

ABSTRACT

The Phenolic compounds were determined in Leaves and Stems of some herbal Plants collected from AL-Gabal AL-Akhder region (Libya) during spring (2013). The plants including (*Thyme, Rosemary, Salvia, Marjoram* and *Hybrid tea rose*). The Phenolic compounds including (Chlorogenic acid, Caffeic acid, 3,4-Dicaffeoyl quinic acid, 3,5-Dicaffeoyl quinic acid, 4,5-Dicaffeoyl quinic acid, Galic acid, Catecin, Rutin and Tannic acid). The obtained results showed that, the contents of Phenolic Compounds were fluctuated as following: Chlorogenic acid (0.71- 11.14ppm), Caffeic acid (ND- 0.18ppm), 3,4-Dicaffeoyl quinic acid (ND- 2.09ppm), 3,5-Dicaffeoyl quinic acid (0.73- 4.04ppm), 4,5-Dicaffeoyl quinic acid (ND- 0.85ppm), Galic acid (0.59- 4.41ppm), Catecin (ND- 24.9ppm), Rutin (ND) and Tannic acid (ND) in Leaves. While the same above compounds in Stems were ranged as following: Chlorogenic acid (ND- 19.8ppm), Caffeic acid (ND- 36.25ppm), 3,4-Dicaffeoyl quinic acid (ND- 19.8ppm), 3,5-Dicaffeoyl quinic acid (0.5- 84.4ppm), 4,5-Dicaffeoyl quinic acid (ND- 20.03ppm), Galic acid (ND- 2.8ppm), Catecin (ND- 1.3ppm), Rutin (ND- 20.6ppm) and Tannic acid (ND- 20.8ppm). The high levels of most the studied phenolic compounds were recorded in Stems comparing with Leaves.

Key words: Herbal Plants, Phenolic Compounds, Libya.

INTRODUCTION

In Libya there are about 1,825 vascular plant species, of which 134 are endemic. About 450 species are reported to be of medicinal value (Auzi, 1999). Some important plant families are Apiaceae, Asteraceae, Lamiaceae, Poaceae, Fabaceae, Brassicaceae and Abiaceae. Medicinal plants are distributed all over the country especially in the Al-Jabel Al-Akhdar, Ghadames, Gharian, Awbari and Tarhona regions. (Guenther, 1972; Rateeb *et al.*, 1996). More than 100 species are extensively used by Bedouins and local people in folk medicine drinks, or chewed fresh or dry. They are used to cure dermal diseases, viral or bacterial infections, insect or animal bites, burns and sometimes to treat hair problems.

These medicinal plants are very well documented in different floras (El-Gadi and Bshana, 1992; Kotb, 1985). The aim of this study to identification and determination the phenolic compounds in the select herbal plants in the studied area.

MATERIALS & METHODS

Sampling

Five different herbal plants samples were collected from Al-Gabal Al-Kadar Region (Libya) during Winter-Spring 2012/2013 Seasons, The Samples including (*Thyme, Rosemary, sage (salvia), Marjoram* and *Hybrid tea rose*).

Samples preparation

The leaves and stems were separated from each plant and washed several times with distilling water and then dried in dark place and sorted.

Corresponding Author

Hamad M Idres Hasan

Email: - drhamadmhasan85@yahoo.com

Phenolic compounds analysis

Defatted sample extraction was used to identification the types and determinate the phenolic compounds by using the GLC method.

RESULTS AND DISCUSSION

The Phenolic Compounds Content (mg/ml) of the Leaves and the Stems of Five herbal plants:

Thyme: The concentration of Phenolic compounds are as following: Chlorogenic acid (0.704, 0.352), Caffeic acid (0.187, ND), 3,5-Dicaffeoyl quinic acid (0.739, 0.5), 4,5-Dicaffeoyl quinic acid (0.855, ND), Galic acid (0.597, 0.137) and Catecin (ND, 1.30651). The high concentration was recorded for Catecin (1.30651) in Stems, and the Low concentration was recorded for Galic acid (0.137) in Stems, with absence of 3,4-Dicaffeoyl quinic acid, Rutin acid and Tannic acid (Table 1 & Fig 1).

Rosemary: The concentration of Phenolic compounds are as following: Chlorogenic acid (5.26, 19.8), Caffeic acid (ND, 19.86), 3,4-Dicaffeoyl quinic acid (1.428, 19.85), 3,5-Dicaffeoyl quinic acid (3.28, 19.922), 4, 5-Dicaffeoyl quinic acid (ND, 20.03), Galic acid (1.2, 2.88) and Catecin (14.9, ND).

The high concentration was recorded for 4, 5-Dicaffeoyl quinic acid (20.03) in Stems ,and the Low concentration was recorded for Galic acid (1.2) in Leaves, with absence of Rutin and Tanic acid. (Table 2, Fig 2).

Salvia: The concentration of Phenolic compounds are as following: Chlorogenic acid (8.9, ND), Caffeic acid (ND, 31.08), 3,4-Dicaffeoyl quinic acid (1.58, ND), 3,5-Dicaffeoyl quinic acid (3.16 ,83.94), Galic acid (3.75, ND), Catecin (16.95, ND) and Tanic acid (ND, 20.88). The high concentration was recorded for 3,5-Dicaffeoyl quinic acid (83.94) in Stems, and the Low concentration was recorded for 3,4-Dicaffeoyl quinic acid (1.58) in

Leaves ,with absence of 4,5-Dicaffeoyl quinic acid and Rutin. (Table 3 & Fig 3).

Marjoram: The concentration of Phenolic compounds are as following: Chlorogenic acid (4.5, ND), Caffeic acid (ND, 36.25), 3,4-Dicaffeoyl quinic acid (0.891, ND), 3,5-Dicaffeoyl quinic acid (3.4 ,84.8), Galic acid (0.977, ND), Catecin (8.29, ND), Rutin (ND, 20.62) and Tanic acid (ND, 19.55). The high concentration was recorded for 3,5-Dicaffeoyl quinic acid (84.8) in Stems, and the Low concentration was recorded for 3,4-Dicaffeoyl quinic acid (0.891) in Leaves, with absence of 4,5-Dicaffeoyl quinic acid. (Table 4, Fig 4).

Hybrid tea rose: The concentration of Phenolic compounds are fluctuated as following: chlorogenic acid(11.14,ND), caffeic acid(ND, 17.93), 3,4-Dicaffeoyl quinic acid (2.09, ND), 3,5-Dicaffeoyl quinic acid (4.04, 44.15), Galic acid (4.41, ND), Catecin (24.9, ND),Rutin(ND, 10.47) and Tanic acid (ND, 9.23). The high concentration was recorded for 3,5-Dicaffeoyl quinic acid (44.15) in Stems ,and the Low concentration was recorded for 3,4-Dicaffeoyl quinic acid (2.09) in Leaves ,with absence of 4,5-Dicaffeoyl quinic acid. (Table 5, Fig 5). The present results are the first data about some plants in this study(in Libya) as *marjoram* and *Hybrid tea rose*, but by comparing the phenolic compounds which found in *Thyme* and *Salvia* in (Abdullah, 2013) study, there is agreement in same recorded compound with some different in percentage. Most of previous studies gave the total phenolic compounds contents without the type of them, therefore this study give the speciation of phenolic compounds with its concentration. (El-Malki, 2006) recorded phenolic compounds in *thyme* in his study, also (Akrouit *et al.*, 2012) recorded phenolic compounds in *Salvia* .

Figure 1. Phenolic compounds contents (mg/ml) of Leaves and Stems (Legs) of Thyme

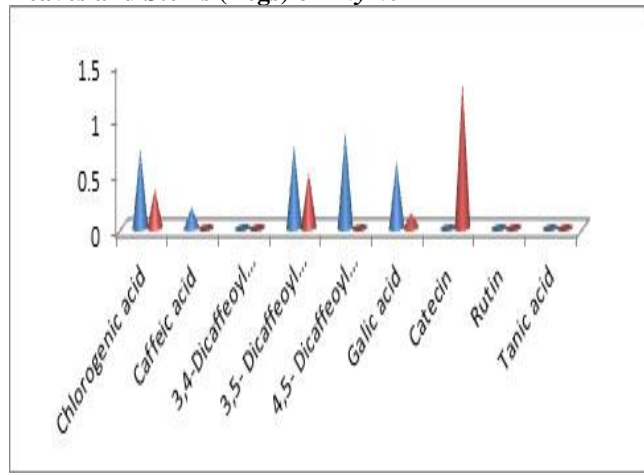


Figure 2. Phenolic compounds contents (mg/ml) of Leaves and Stems (Legs) of Rosemary

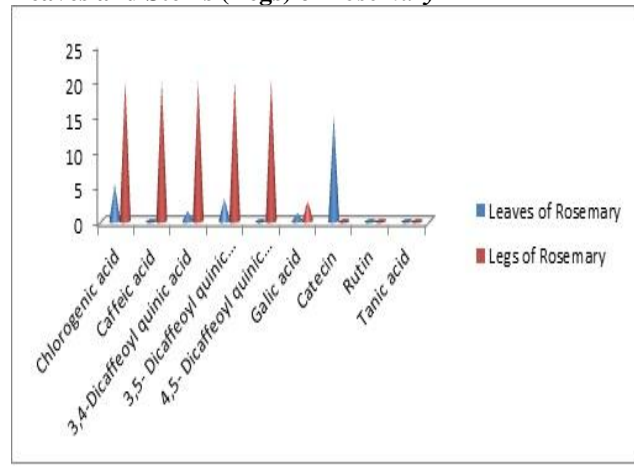
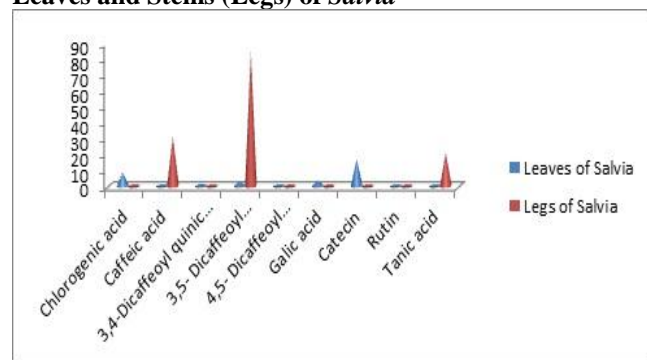
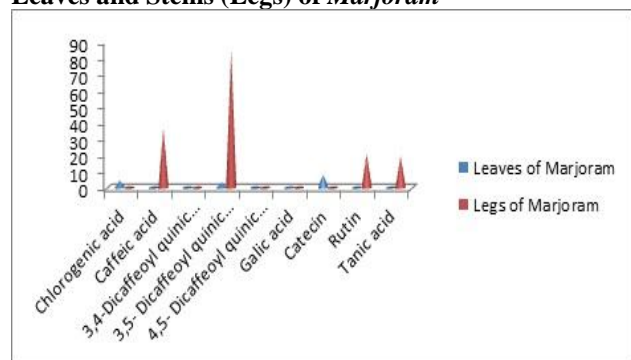
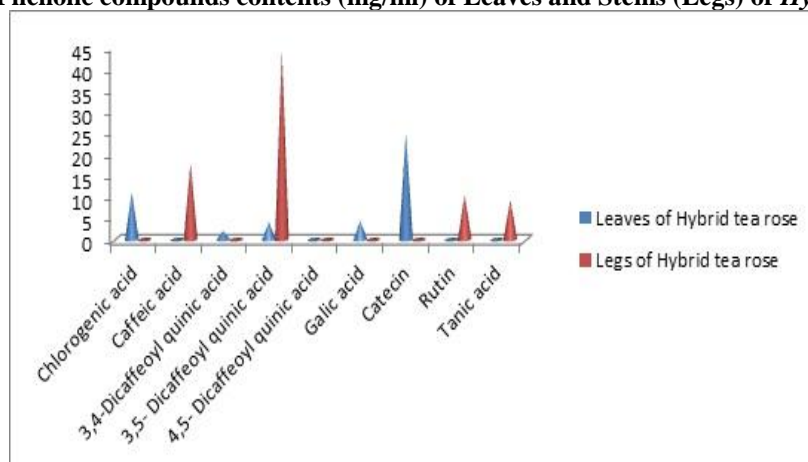


Figure 3. Phenolic compounds contents (mg/ml) of Leaves and Stems (Legs) of *Salvia***Figure 4. Phenolic compounds contents (mg/ml) of Leaves and Stems (Legs) of *Marjoram*****Figure 5. Phenolic compounds contents (mg/ml) of Leaves and Stems (Legs) of *Hybrid tea rose*****Table 1. Phenolic compounds contents (mg/ml) of Leaves and Stems of *thyme***

Phenolic compounds (mg/ml)	Leaves of <i>Thyme</i>	Stems of <i>Thyme</i>
Chlorogenic acid	0.710470	0.352688
Caffeic acid	0.187102	-
3,4-Dicaffeoyl quinic acid	-	-
3,5- Dicaffeoyl quinic acid	0.739437	0.500243
4,5- Dicaffeoyl quinic acid	0.855697	-
Galic acid	0.597933	0.137300
Catechin	-	1.30651
Rutin	-	-
Tanic acid	-	-

Table 2. Phenolic compounds contents (mg/ml) of Leaves and Stems of *Rosemary*

Phenolic compounds (mg/ml)	Leaves of <i>Rosemary</i>	Stems of <i>Rosemary</i>
Chlorogenic acid	5.26950	19.80792
Caffeic acid	-	19.86630
3,4-Dicaffeoyl quinic acid	1.42837	19.85736
3,5- Dicaffeoyl quinic acid	3.28462	19.92282
4,5- Dicaffeoyl quinic acid	-	20.03978
Galic acid	1.20524	2.88261
Catechin	14.92312	-
Rutin	-	-
Tanic acid	-	-

Table 3. Phenolic compounds contents (mg/ml) of Leaves and Stems of *Salvia*

Phenolic compounds (mg/ml)	Leaves of <i>Salvia</i>	Stems of <i>Salvia</i>
Chlorogenic acid	8.92851	-
Caffeic acid	-	31.08961
3,4-Dicaffeoyl quinic acid	1.58057	-
3,5- Dicaffeoyl quinic acid	3.16004	83.94162
4,5- Dicaffeoyl quinic acid	-	-
Galic acid	3.75071	-
Catecin	16.95071	-
Rutin	-	-
Tanic acid	-	20.88958

Table 4. Phenolic compounds contents (mg/ml) of Leaves and Stems of *Marjoram*

Phenolic compounds (mg/ml)	Leaves of <i>Marjoram</i>	Stems of <i>Marjoram</i>
Chlorogenic acid	4.50604	-
Caffeic acid	-	36.25766
3,4-Dicaffeoyl quinic acid	0.209598	-
3,5- Dicaffeoyl quinic acid	3.40182	84.87573
4,5- Dicaffeoyl quinic acid	-	-
Galic acid	0.977583	-
Catecin	8.29664	-
Rutin	ND	20.62279
Tanic acid	-	19.55359

Table 5. Phenolic compounds contents (mg/ml) of Leaves and Stems of *Hybrid tea rose*

Phenolic compounds (mg/ml)	Leaves of <i>Hybrid tea rose</i>	Stems of <i>Hybrid tea rose</i>
Chlorogenic acid	11.14792	-
Caffeic acid	-	17.93782
3,4-Dicaffeoyl quinic acid	2.09598	-
3,5-Dicaffeoyl quinic acid	4.04476	44.15800
4,5-Dicaffeoyl quinic acid	-	-
Galic acid	4.41506	-
Catecin	24.90947	-
Rutin	-	10.47080
Tanic acid	-	9.23262

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