Journal of Genetic and Environmental Resources Conservation, 2016, 4(1):66-71.
www.jgerc.com

Chemical study for some species of *Astragalus* L. (Fabaceae family) in Iraq

Khalil A. Al-Shammary[1] and Khansaa R. Al-Joboury[2]*

[1]College of Science, [2]Iraq Natural History Research Center and Museum, University of Baghdad, Baghdad, Iraq.
*Corresponding author: mkansaa@yahoo.com

Abstract

In continuation of our chemical studies on the secondary metabolites of ten species of *Astragalus* L. which are they: *A. pulchellus*, *A. mollis, A. sarae*, *A. corrugatus*, *A. hauarensis*, *A. campylorrhynchus*, *A. hamosus, A. alyssoides*, *A. guttatus*, *A. oxyglottis.* The method for the analysis of the flavonoids in *Astragalus* L. species was high performance liquid chromatography (HPLC) from the ethanol extract of the leaves. Results revealed that there were 8 flavonoids compounds in these species: myrectin, quercetin, rahmnocitrin, isorhamnetin, kaempherol, formononetin, rutin and apigenin.

Keywords: *Astragalus* L., Flavonoids, HPLC, Fabaceae, Iraq.

Introduction

Astragalus L. is one of the largest genera of vascular plants in the world, with an estimated number of 3000 species. Many species are narrow endemics (Maassoumi, and Ranjbar, 2010). However, a few are widespread, mainly in the Northern Hemisphere, Central Asia, and Western North America (Akan and Acık, 2004), which belongs to Fabaceae family and belongs to the subfamily Papilionoideae under the subtribe *Astragalinae* of the tribe *Galegeae,* the genus is most diverse in the Irano-Turkish region of South-Western Asia consists of approximately 650 genera and 18,000 species, it is one of the largest Angiosperm families (Chaudhary *et al.*, 2007). It is also the largest genus in Iraq, where it is represented by nearly 130 species in 36 sections (Townsend and Guest 1974). *Astragalus* L. is not only the largest in numbers rather it is also considered one of the most diverse and taxonomically difficult genera in legumes (Maassoumi, 1998). The delimitation of taxa at various taxonomic ranks poses considerable taxonomic problems in the genus worldwide (Xu and Podlech, 2010). It has been widely realized that at many places morphological characters alone are not sufficient to explain the systematic relationships among *Astragalus* species (Maassoumi and Ranjbar, 2010). Although there are many systematic, anatomic, karyological and palynological studies on the *Astragalus* L. species, some taxonomic problems concerning this genus have not been resolved yet (Khodaei *et al*. 2007). HPLC is now commonly used for the separation of complex mixtures of flavonoids in plant (Lamer, 2002). The flavonoid pathway is part of the larger phenylpropanoid pathway, which produces a range of other secondary metabolites, such as phenolic acids, lignins, lignans, and stilbenes. The key flavonoid precursors are phenylalanine, obtained via the shikimate and arogenate pathways and malonyl-CoA, derived from citrate produced by the TCA cycle. Most flavonoid biosynthetic enzymes characterized to date are thought to operate in enzyme complexes located in the cytosol. Flavonoid end products are transported to various subcellular or extracellular locations, with those flavonoids involved in pigmentation generally being transported into the vacuole (Lock and Schrire, 2005). Thus, in the present study *Astragalus* L. species have been investigated flavonoids leaves, stems and roots. (Podlech, 2009). This is the first report on these species based on Iraq material for these properties.

Materials and Methods

The powder 1/2 gram were soaked in 25 ml ethanol water 30/70 v/v for 12hrs. The aqueous extract (Ex) were obtaining by using boiling distilled water (200ml), which was poured over the homogenized extract, the mixture was placed in an ultrasonic bath for 20min and passed through a filter. After filtration, 100ml of aqueous extract were acidified with 0.5ml of 98% acetic acid to pH 3 and applied to the octadecyl column, which was then washed with 100ml of methanol. The elute was evaporated using evaporator to dryness then the extract re-dissolve in 1ml of the mobile phase to obtained (1ml) of the final extracted, then 20 ml

were subjected to HPLC analysis.

Calculation:

$$\text{Concentration of sample ug/ml} = \frac{\text{area of sample}}{\text{Area of standard}} \times \frac{\text{con. of standard x dilution factor}}{}$$

Results and Discussion

HPLC is becoming by far the most popular technique for the separation of flavonoids, both on preparative and analytical scales. Improvements in instrumentation, packing materials, and column technology are being introduced all the time, making the technique more and more attractive (Bedir, *et al*. 2000). In leaves the following flavonoides compounds have been detected in *Astragalus* speices by HPLC were: myrectin, quercetin, rahmnocitrin, isorhamnetin, kaempherol, formononetin, rutin and apigenin (Figures 1-10). The study showed that there were differences between species in Flavonoides compounds and in its concentrations and the maximal amount of flavonoid constituents determined by HPLC in the plant was 0.55gm/ml for kaempherol in the species *A. corrugatus* but the minimum amount of flavonoid constituents determined was 0.07gm /ml for Myrectin in the species *A. hauarensis*, some species do not contain one or more of this Flavonoides compounds (Guzhva, 2010). Although this work is a preliminary study, it seems evident that the bioactive secondary metabolites isolated from *Astragalus L.* like flavonoids could be of taxonomic importance for the chemotaxonomical studies in the future, The delimitation of taxa at various taxonomic ranks implies considerable taxonomic problems in the genus throughout the world (Niknam, *et al*. 2003). It is very important to indicate that at many places morphological characters alone are not sufficient to determine the systematic relationships among *Astragalus* species and their sections (Khoron'ko, 1973). However, further phytochemical and molecular phylogenetic investigations on *Astragalus* genus are required to show particularly the relationship of species in the same section with another and to establish clearly the chemotaxonomical classification of the genus *Astragalus* (El-Hawiet *et al.,* 2010).

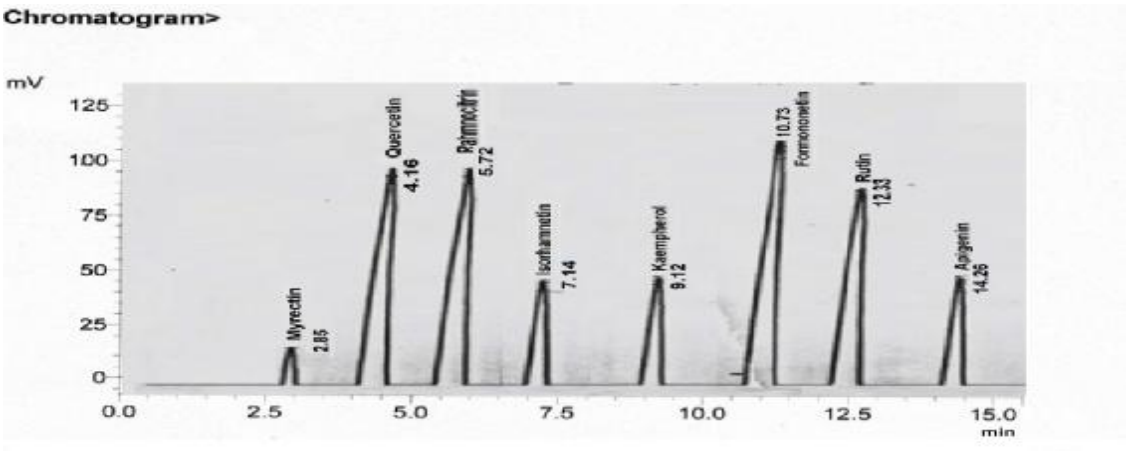

Figure (1): HPLC chromatogram of standard samples

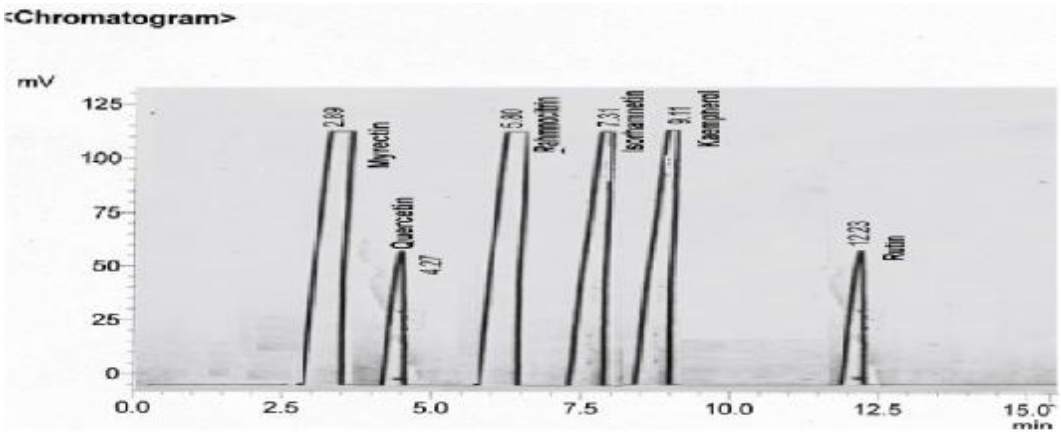

Figure (2): HPLC chromatogram of *A. pulchellus*

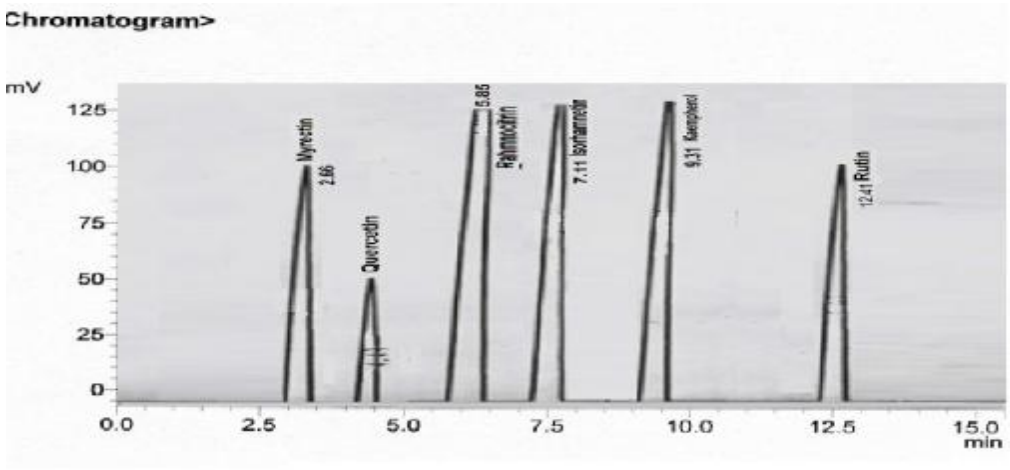

Figure (3): HPLC chromatogram of *A. mollis*

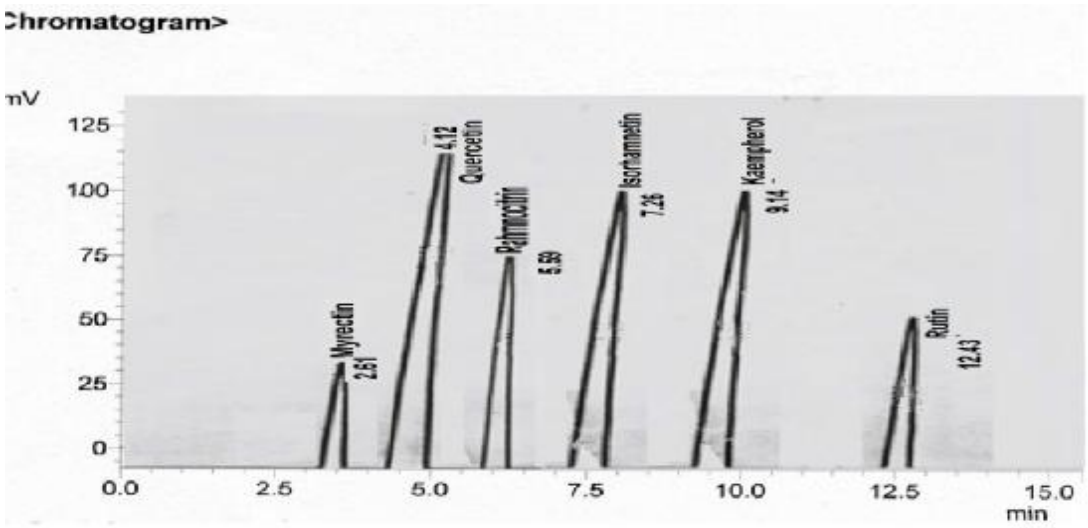

Figure (4): HPLC chromatogram of *A. sarae*

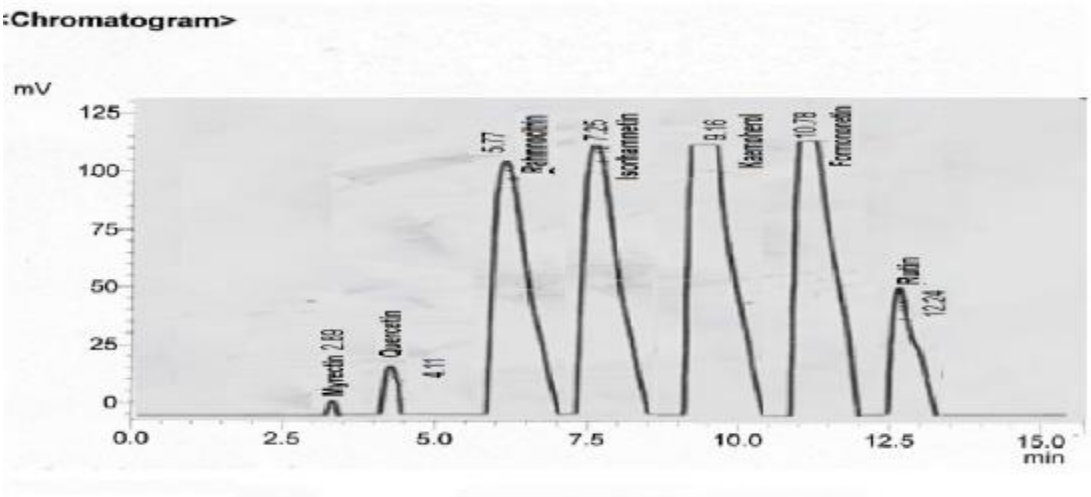

Figure (5): HPLC chromatogram of *A. corrugatus*

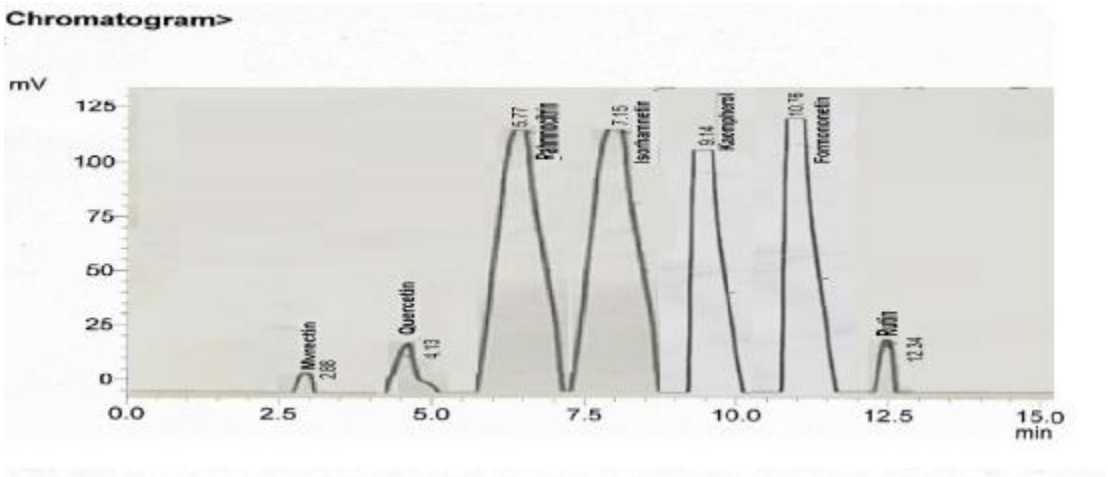

Figure (6): HPLC chromatogram of *A. hauarensis*

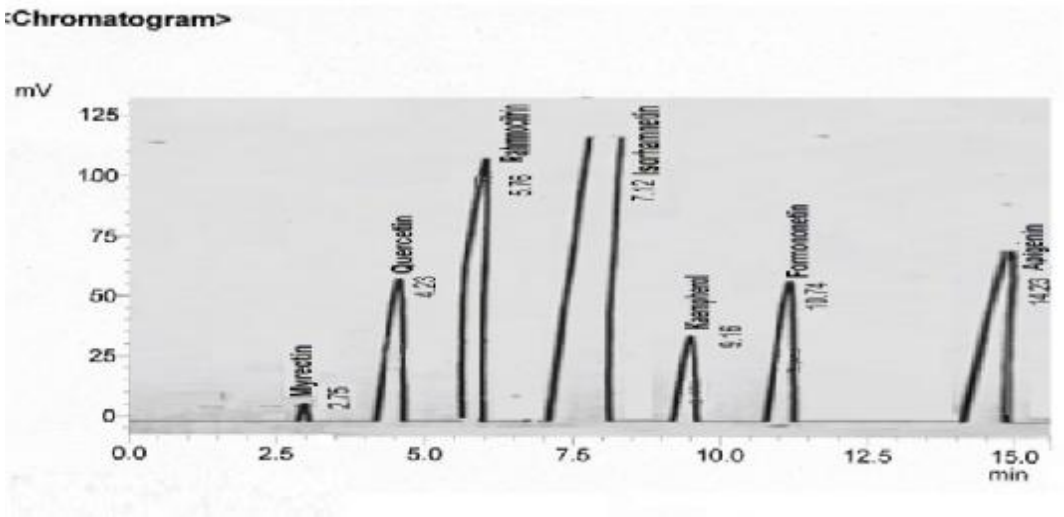

Figure (7): HPLC chromatogram of *A. campylorrhynchus*

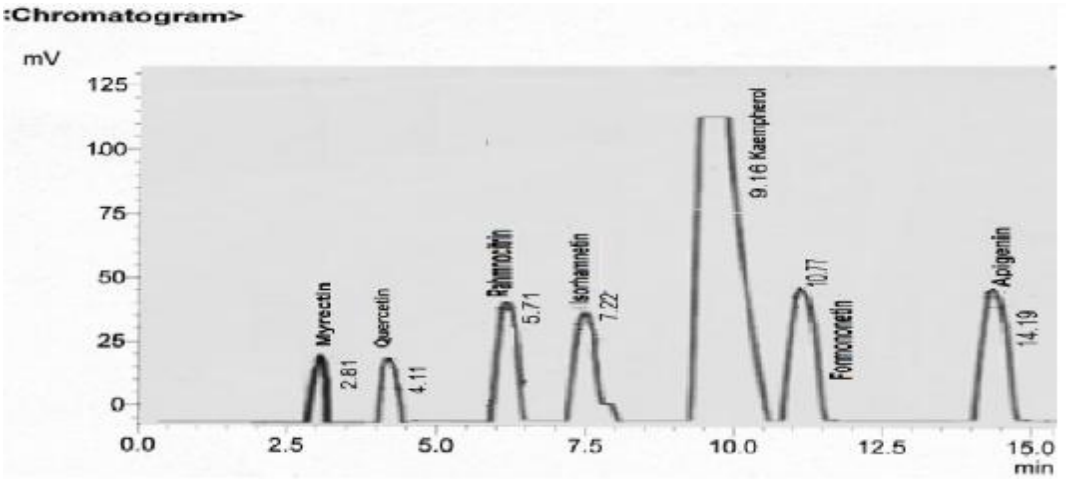

Figure (8): HPLC chromatogram of *A. hamosus*

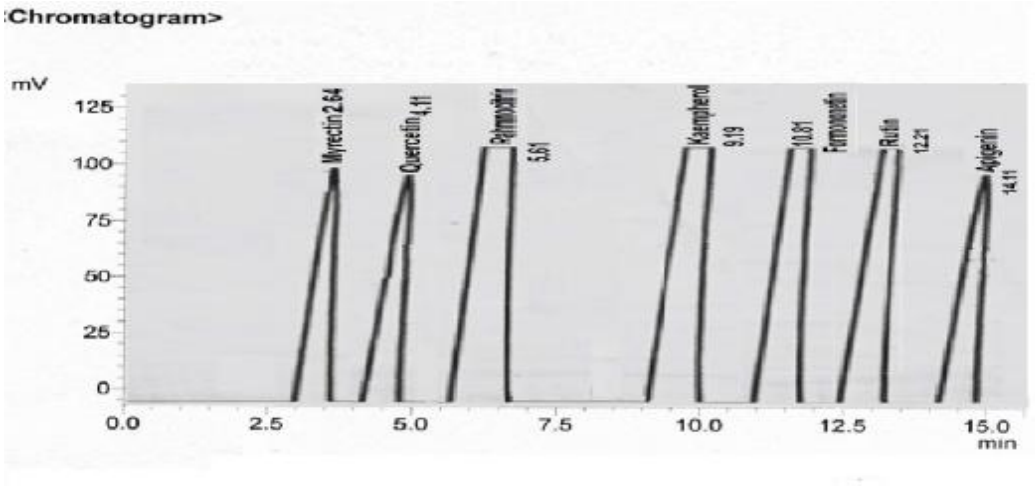

Figure (9): HPLC chromatogram of *A. alyssoides*

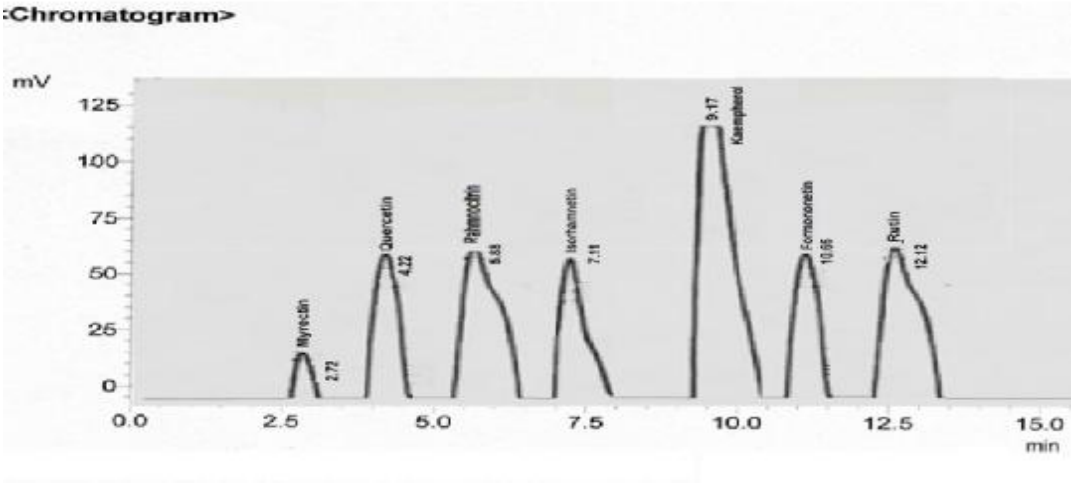

Figure (10): HPLC chromatogram of *A. guttatus*

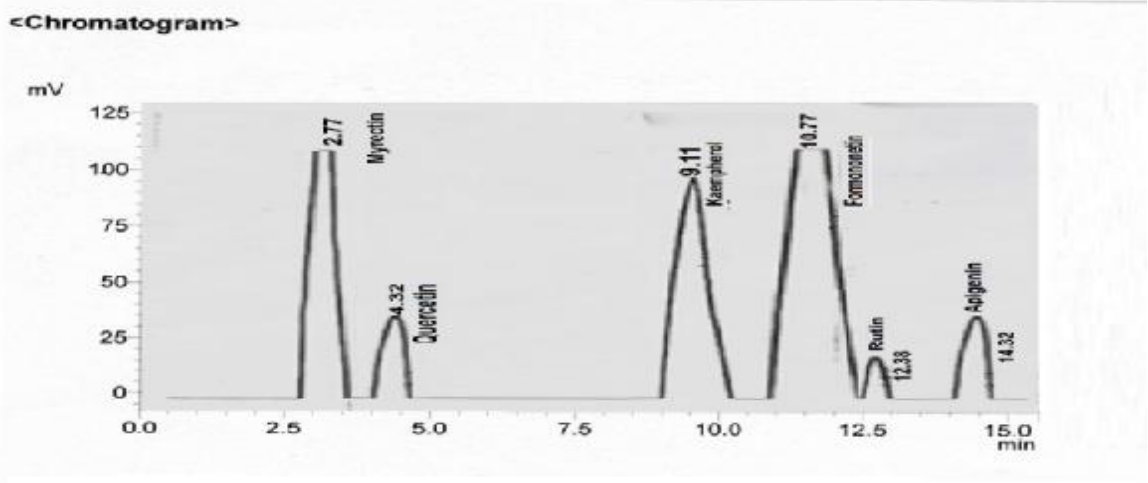

Figure (11): HPLC chromatogram of *A. oxyglottis*

References

Akan, H. and Aytac, Z. 2004. *Astragalus ovabaghensis* (Fabaceae), a new species from Turkey. Ann. Bot. Fennici., 41: 209–212.

Bedir, E.; Çalis, I.; Piacente, S.; Pizza, C. and Khan, I. 2000. A new flavonol glycoside from the aerial parts of *Astragalus vulneraria*, Chem. Pharm.

Bull., 48: 1994-1995.
Chaudhary, L.; Rana, D. and Narzary, S. 2007. A new species of *Astragalus* L. (Leguminosae) from India based on morphological and molecular markers. Bot. J. Linn. Soc., 154: 27-34.
El-Hawiet, A.; Toaima, S.; Asaad, M.; Radwan, M. and El-Sebakhy, N. 2010. Chemical constituents from *Astragalus annularis* Forssk. and *A. trimestris* L., Fabaceae, Braz. J. Pharmacognosy. 20: 860-865.
Guzhva, N. 2010. Flavonoids and hydroxycinnamic acids from *Astragalus asper*, Chem. Nat. Comp., 46, 303-304.
Khodaei, Z.; Zarre, S.; Podlech, D. and Karamali, Z. 2007. Cladistic analysis of *Astragalus* sect. *Rhacophorus* (*Fabaceae)* based on morphological, anatomical and seed microsculpturing evidence. In: Int. Symp. 7th Plant Life of South West Asia (7th Ploswa), 25-29TH June 2007. Poster Abstracts, 97pp. Eskisehir, Turkey.
Khoron'ko, A. and Glyzin, V. 1973. Flavonoids of *Astragalus dasyanthus*, Chem. Nat. Comp., 9: 403.
Lamer, E. 2002. Chromatographic analysis of isoflavonoids in herb and roots of *Astragalus membranaceus*. Abstracts of the XXVI Symposium 'Chromatographic methods in analysis of organic com pounds', Katowice-Szczyrk, Poland.
Lock M. and Schrire, B. 2005. Galegeae. In: G. P. Lewis, B. D. Schrire, B. A. Mackinder, M. Lock ed., Legumes of the world, Royal Botanic Gardens, Kew, India.
Maassoumi, A. 1998. *Astragalus* in the Old World. Research Institute of Forests and Rangelands,Teheran, Iran.
Maassoumi, A. and Ranjbar, M. 2010. Revision of the Genus *Astragalus* L. Sect. Leucocercis Bunge (Leguminosae) from Iran. Iranian J. Botany, 7(2): 239-224.
Niknam, V.; Ebrahimzadeh, H. and Maassoumi, A. 2003. Toxic nitro compounds in *Astragalus* species, Biochem. Syst. Ecol., 31: 557-562.
Podlech, D. 2008. The genus *Astragalus* L. (Fabaceae) in Europe with exclusion of the former Soviet Union, Feddes Repertorium, 119: 310-387.
Townsend, C. and Guest, E. 1974. Flora of Iraqi. Vol. 3. Ministry of Agriculture and Agrarian Reform, Baghdad, Iraqi, 154-196pp.
Xu, L. and Podlech, D. 2010. *Astragalus*. In: Z. Y. Wu, P. H. Raven and D. Y. Hong eds., Flora of China, Vol. 10 (Fabaceae). Science Press: Beijing, and Missouri Botanical Garden Press, St. Louis.