Terpenoids from Iranian *Artemisia* Species

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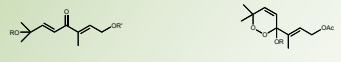
Introduction

Artemisia is a genus of small herbs or shrubs found in Northern temperate regions. It belongs to the important family Compositae (Asteraceae), one of the most bulky vegetal groupings, which comprises about 1000 genera and over 20,000 species. Within this family, *Artemisia* is included into the tribe Anthemideae and comprises itself over 400 species. The 400 species of *Artemisia* are mainly found in Asia, Europe and North America. They are mostly perennial herbs and shrubs dominating the vast steppe communities of Asia [1]; 150 recorded for China, about 50 reported to occur in Japan and 35 species of the genus are found in Iran, of which two are endemic: ***A. melanolepis* Boiss.** and ***A. kermanensis* Pold.** [2].The Genus *Artemisia* has always been of great botanical and pharmaceutical interest and is useful in traditional medicines for the treatment of the variety of diseases and complaints. ***Artemisia annua*** is a traditional medicinal herb of China. It is presently being cultivated on a commercial scale in China and Vietnam for its antimalarial sesquiterpene lactone artemisinin and its essential oil. The genus *Artemisia* including some Iranian species has been studies chemically and present of monoterpenes, sesquiterpenes, especially sesquiterpene lactones and essential oils reported. In fact, Iranian *Artemisia* spp. has yielded a considerable amount of new, interesting terpenoids.

Monoterpenes

Acyclic monoterpenes and monoterpene hydro peroxides have been found in aerial parts of ***A. aucheri* Boiss**.[3]



	1	2	3	4	5
R	H	H	Ac	OH	OH
R'	H	Ac	Ac	H	Ac

6 R=H
7 R=Me

The extract of the aerial parts of ***A. diffusa* Krasch. ex. Poljakov.,** afforded in addition to several sesquiterpenoids, a monoterpene lactone, namely filifolide A, an uncommon compound type [4].

Filifolide A

Another example of an unusual monoterpene is filifolone which has been identified in the essential oil of ***A. sieberi* Bess. [5].**

Filifolone

Another example of a new bicyclic monoterpene was the analysis of the aerial parts of ***A. gypsacea* Krasch., M. Pop. et Lincz. ex Poljak.** which has been afforded a new derivative of β- pinene (2β- hydroxyl- 5- keto- β- pinene) [6]

2β- hydroxyl- 5- keto- β- pinene

In the essential oil of ***A.sieberi* Bess.**, more than 160 constituents were identified representeting 99% of the total amount. The oil consists of c.15% of monoterpene hydrocarbons and c. 78% of oxygenated monoterpenes. The oxygenated monoterpenes are dominated by camphor (44%), 1,8- cineole (19%), terpinen-4-ol (2.5%), α- terpineol (2%) and a trace of dehydro-1,8- cineole (0.24%) [5].

Dehydro- 1,8- cineole

Sesquiterpenes

Cyclic sesquiterpenes with less common frameworks have been described in ***A. sieberi* Bess.** Characteristic examples are the biasbolene derivatives and a salsolene ketone [5,7]

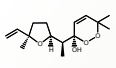
Compound	R
1	COMe
2	COEt
3	COiPr
4	COPr
5	COiBu
6	COBu
7	H

1(E)- Dehydrosesquicineole-12-yl- acetate
2(E)- Dehydrosesquicineole-12-yl- propionate
3(E)- Dehydrosesquicineole-12-yl- isobutyrate
4(E)- Dehydrosesquicineole-12-yl- butyrate
5(E)- Dehydrosesquicineole-12-yl- isovalerate
6(E)- Dehydrosesquicineole-12-yl- valerate
7(E)- Dehydrosesquicineole

Salsolene Ketone

Bisabola-2,11- dien- 1(10), 7(10)- acetal

The extract of the aerial parts of ***A. deserti* Krasch.** afforded in addition to several sesquiterpene lactones a cyclic peroxide sesquiterpene [8,9].



Sesquiterpene lactones

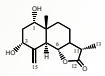
The extract of the aerial parts of ***A. diffusa*** afforded several eudesmanolides (1a, 1b, 2a, 2b, 3a, 3b, 4) and a new type of sesquiterpene lactone with unusuall carbon skeleton, an eight- member ring (Tehranolide) [4].

1a
1- epi- Artemin

1b
Artemin

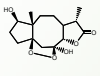
2a

2b



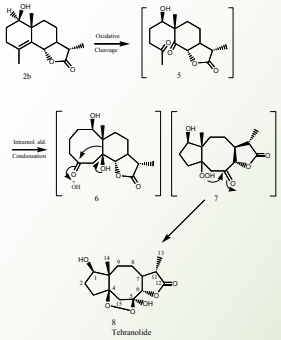
3a
Erivanin

3b
1- epi- Dehydroisoerivanin



Tehranolide

Most likely this unusual carbon skeleton was formed by oxidative cleavage of the Δ4 bond of 2b followed by an internal aldol condensation of the intermediate 5 affording the dihydroxy ketone 6. The latter then could be rearranged to the lactone 7 by attack of HO + followed by acetal formation to give the lactone 8 (Tehranolide).



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Tehranolide

We report here the antimalaria properties of crude extract of the same species (***A. diffusa***). The study especially examine the inhibitory effects of the extracts on developmental stages of in vivo of *plasmodium berghei* on mice body.
Since the endoperoxide group is an essential requirement for the antimalarial activity of Artemisinin, we presume the antimalarial properties of the crude extract of ***A. diffusa*** are attributed to Tehranolide.The preliminary experiments, the toxicity of the ethanolic extract was rested, and judging from the high doses that were tolerated without significant overt mortality or signs of toxicity, it was estimated that the plant etanolic extract is of relatively low toxicity.

The aerial parts of ***A.tournefortiana* Reichb.** afforded three new udesmanolides with a 12,6β- lactone ring and the new corresponding acids which may be the precursors of the lactones [3].

1R= O
2R= βOH, H
3R= βOAc, H

4R= O
5R= βOAc, H

References

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