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Phytochemistry of *Prangos ferulacea* (L.) Lindl. in one of the Habitats of Zagros Mountain

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ABSTRACT *Prangos ferulacea* (L.) Lindl. (Umbelliferae family) is a dominant species in the some partial of habitats in Zagros Mountains. According to ethno-botanical studies, this plant is one of the best range plants of Iran. Local ranchers collect green Prangos while it is toxic. They then dry the plant and use it to feed their livestock, especially in winter season. This research done to analyse the changes in the chemical composition of *Pr. ferulacea* with the effects of time, location and type of secondary metabolisms. Therefore, the ingredients and amounts of the essential oils of Prangos were studied during the growing and flowering stages (in both green/fresh and dried forms) to track such changes. The results showed that the amounts of terpinolene, β-phellandrene and bornyl acetate were decreased in the dried form, and some of the harmful components, such as α-pinene, β-pinene, myrcen and delta-3-carene, were absent, rendering the plant non-toxic. These results confirm the opinion of the ranchers. In the growing stage, the amount of coumarin was significantly less than in the flowering stage, which also supports the conduct of the local ranchers who gather the plants at the most appropriate time.

Key words: *Chemical compounds, Ethno-botany, Iran, Phytochemistry, Pr. ferulacea (L.) lindl., Zagros*

1 INTRODUCTION

The Prangos genus in the Umbelliferae family is represented by 15 species in Iran. *Pr. ferulacea* Lindl. is a long and permanent herb that is mainly used as a rich herb in animal feeding. The essential oils are mainly used in nutritive and pharmaceutical industries and as antibacterial agents. The plants produce secondary metabolisms in different climatic conditions and under the effect of different time and localities; for instance, *Pr. ferulacea* grows in the Markazi, Fars, Chaharmahalo Bakhtiari, Esfahan, Kermanshah, Lorestan, Hamedan, Kurdestan and Kerman provinces as well as in some parts of Alborz Mountain (13). According to ethno-botanical studies, this plant is one of the best foliage plants of Iran. Traditional ranchers collect green Prangos, when it is toxic; they then dry the plant and use it to feed their livestock especially in winter season. This

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research in ethno-botany and phytochemistry has been conducted to increase knowledge and to address challenges for sustainable management. Due to the importance of Prangos and its extensive dispersion, a number of useful studies on the plant have been carried out, including the following researches.

Sefidkon (2000) extracted the aerial parts of *Pr. ferulacea* by steam-distillation at a site in Alborz and analysed the chemical compositions of the essential oils by GC and GC/MS. The yield of essential aerial oil was 2.33%. The main compounds, were β-pinene (22.9%) and 3-carene (16%). Amiri (2007) studied the quantitative and qualitative changes in *Pr. ferulacea* in different growing stages using hydro-distillation at a site in Zagros. His results had shown the main compounds were α-pinene and β-pinene in each stage. In this regard, Hoseini and Malekpour (2006) have recommended *Pr. ferulacea* as a cultivable plant (from an economic point of view). Regarding the high amount of essential oils in this plant, they have identified that essential oils of the aerial parts of Prangos can be used industrially. Alikhah *et al.* (2008) studied the relationship between palatability and forage quality of *Pr. uloptera* in Alborz. The extracted essential oils in dried form was also evaluated by hydro-distillation.

Studies on coumarin include Nazari's (2001) research on the phytochemistry and coumarin content of *Pr. asperula* in Iran. The results showed that feeding livestock via this plant in the green form caused digestive disorders. Eshbakova *et al.* (2006) identified four coumarin-like components ($C_{16}H_4O_4$, mp 108-109ºc ؛$C_{16}H_{14}O_4$, mp 102-103ºc ؛$C_{19}H_{20}O_5$, mp 132-140ºc and $C_{16}H_{16}O_6$, mp 132-133 ºc) in *Pr. ferulacea* in Turkey. Sagun *et al.* (2006) identified high amounts of coumarin and terpenoides in *Pr. ferulacea* extract. Also an anti-bacterial extract has been reported, which contains coumarin derivatives. They can be used in the treatment of infectious disease and severe human meningitis. Razavi *et al.* (2008) identified five coumarin components, Xanthotoxin, Prangenin, Scopoletin, Deltoin and Prangolarin, in the aerial parts of *Pr. uloptera* by chromatography, TLC and the use of silica gel.

Because the ethno-botany of ranchers is the result of several years experience and precise knowledge about grazing behaviour of livestock, it could possess some instructive and sophisticated aspects. Therefore, this research is a strong effort to analyse and interpret the experiences of ranchers by careful use of laboratory instruments and equipment.

2 MATERIALS AND METHODS

The study area is located in the north of the Fars province in [52° 25′ 34″] eastern longitude and [30° 29′ 45″] northern latitude, with a 1, 590, 200-ha area. The highest and lowest elevations are 4943 m and 1440 m, respectively. The most rainfall is 1323 mm y^{-1} in the west of the region, 500 mm y^{-1} in the middle of the region and the lowest is 150 mm y^{-1} in the east of the region (Tayebi Khorami, 2006).

The main sites for *Pr. ferulacea* were identified by field investigation, office work and ethno-botanical approaches. Accordingly, Asopas and Khorambid, which are located in the north of Fars province, were chosen as two pasture sites. Characteristics of the studied sites are shown in Table 1.

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Table 1 The characteristics of studied sites.

Name of site	Eastern longitude	Northern latitude	Elevation (m)	Average of rainfall (mm y^{-1})	Vegetation types
Asopas	52° 25'	30° 29'	2120	529	*Pr. ferulacea* (1) *As. siliquosus* (2)
Khorambid	53° 16'	30° 18'	1900	283	*As. Siliquosus* *Ar. Aucheri* (3) *Pr. ferulaceae*

1. *Prangos ferulacea* (L.) Lindl. 2. *Astragalus siliquosus* Boiss. 3. *Artemisia aucheri* Boiss

2.1 Plant Sampling

Prangos begins flowering in June, continues flowering until July and then starts to seed through the end of July. Re-growth of this plant begins after hibernation in April. It is noteworthy that local ranchers collect Prangos traditionally. Collection of the plant was performed at two different times i.e. growing and flowering stages. At each site, the aerial parts of five stands of *Pr. ferulacea* were collected during April and June 2009 for growing and flowering stages, respectively. The collected samples were analysed in the herbarium of the Faculty of Pharmacy of Tehran University. Then, these samples were cut into pieces and mixed together in the laboratory. Three samples of that mixture were selected for three repetitions of the test. The chemical components of the essential oils were analysed by GC and GC/MS and identified by reliable references (Amiri, 2007; Mirza, 1996).

2.2 Drying and Extraction Procedures

These samples were then extracted while they were still green/fresh. Another five stands of *Pr. ferulacea* were selected for extracting in dried form. The drying process was done far from direct light and at a normal temperature in the laboratory for more than one month. The dried plants were then powdered, and their essential oils were isolated/extracted by hydro-distillation for four hours. The oil was dried using Na_2So_4 and stored at 4°C (Jaimand, K. and Rezai, 2006, Mirza, 1996).

2.3 GC and GC/MS

In this research the chemical components of essential oils was analyzed by GC and GC/MS and recognized by reliable references. GC/MS analysis was conducted with a Shmadzu (Japan) model GC Agilent 6890 gas chromatograph coupled to a Shimadzu model GC/MS Agilent 5973 mass spectrometer equipped with a flame ionization detector. The analysis was carried out using a HP-5MS fused-silica column (30 m x 0.25 mm, film thickness 0.25. The operating conditions were as follows: injector and detector temperature, 220ºC and 290ºC, respectively; carrier gas, H2. Oven temperature program was 50º –240ºC at the rate of 4ºC/min. Mass spectrometer conditions were: ionization potential 70 eV; electron multiplier energy 2000 V.

Compounds were separated on a 30 m * 0.32 mm i.d. fused-silica capillary column coated with a 0.25µm film of HP-5MS. Helium at 0.8 mL min^{-1} was used as carrier gas. Split injection was performed at a split ratio of 1:50. The detector and injection port temperatures were 290 and 220ºC, respectively, and the column temperature was increased from 50 to 240 C at 3º min^{-1} and then to 300ºC at 15º min^{-1} (Jaimand and Rezai, 2006).

2.4 Thin Layer Chromatography (TLC)

Thin layer chromatography (TLC) is a chromatography technique used to separate mixtures.

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In this study the samples of Prangos in the growing and flowering stages were milled for quality analysis by a coumarin test. A volume of 200 cc ethanol (80%) was added to 20 g of each sample. The samples were then warmed by a heater for 10 min from the time of boiling. They were then filtrated and kept in a Benmari instrument for one day. When the extracts were dried completely, 25 cc chloroform was added to each one. Using a sonicator, two homogeneous solutions were achieved. Then the compounds of plant extracts were separated by polarity (structure factor), using TLC. The stationary phase included a plate of silica gel 60 F_{254} and a mobile phase consisting of 10% ethanol and 90% chloroform. In the spotting phase, a spot was created on the TLC plates using hairy tubing. Spotted papers were then placed in the chromatography tank. After a few minutes, the coloured line reached almost a half centimetre from the top of the paper. The paper was dried rapidly and put under the UV cabinet. The paper was then observed using a 366-nm wavelength light. The TLC plate was then impregnated with a coumarin indicator (10g KOH, to which was added alcohol) and observed again under UV light. At the end, the colour intensity and weakness from yellow to green light was rated from +1 to +4 (Nazari, 2001; Razavi *et al.,* 2008).

2.5 Statistical analysis

In this study, a statistical comparison between the percentages of chemical components at the two sites in both the growing and flowering stages and a percentage comparison between the components in green/fresh and dried forms were performed using SPSS statistical software (Table 2).

The Levene test showed homogeneous variances of the samples. ANOVA analysis of the variance test also showed no difference between the samples (Sig= 1). LSD and Duncan tests also revealed the same result, and there are no significant differences between the means.

In this research as the results of coumarin qualitative test (observation of the paper under UV) showed that the thickness of the light green line, which represents coumarin, was significantly greater in the flowering stage.

3 RESULTS

The distribution of *Pr. ferulacea* in Fars province is shown in Table 3. The most desirability and density ranges of *Pr. ferulacea* were in the north of the Fars province.

The amount and percentage of essential oil components in *Pr. ferulacea* in the growing and flowering stages in both the green/fresh and the dried forms are shown in Table 4.

The results of chemical components analysis of essential oils in the growing and flowering stages of *Pr. ferulacea* from the Khorambid site are presented in Table 5.

Table 2 Comparison of chemical components in essential oils of *Pr. ferulacea* in growing and flowering stages in green and dried form.

Change resources	df	Sum of Square	Mean Square	F
Between groups	7	23.713	3.388	0.045 ^{ns}
Within groups	216	16177.433	74.896	

ns: no significant

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Table 3 Distribution of *Pr. ferulacea* in Fars province.

Name (Position)	Location	Condition
Bavanat	north heights Sarchahan	
Sorian	south heights	
Simakan	north heights	
Eghlid (Timargon, Khalo pinion to Bell mountain)	south heights	Good
Khorambid (Chahsorkh, Abjaro, Cheshme pahn,Tange korak)	north heights	
Bidestan	Between Eghlid and heights	
Roshan mountain	heights between Arsanjan and Bavanat	
Mosa khan mountain	south heights of Khorambid	
Omri mountain	south heights of Khorambid	
-	heights between Namdan and Asopas	
-	heights between Asopas and Emamzade Esmail	
Arjan plain	toward Tangab and Firozabad	Medium
Doshmanziari	-	
Heights Darab	Darab to Estahban	
Heights Javid	towards Sepidan	
Firozabad	-	
Heights Sepidan	towards Arsanjan	
Marvdasht	between Marvdasht and Saadatshahr	
Shiraz	south heights	
Arjan plain	Heights	Poor
Kohmaresorkhi	Heights	
Chehel cheshme	Heights	
Jahrom	distribution at high altitude 2800m	

Table 4 The amount of essential oils (gr) in 100 g of *Pr. ferulacea.*

Life stage / Site	Growing stage		Flowering stage	
	Green (fr.)	Dried	Green (fr.)	Dried
Asopas	1.9	2.1	2.1	2.3
Khorambid	1.7	1.8	1.9	2.1

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Table 5 Some of chemical compositions of essential oils of *Pr. ferulacea* in green (fresh) and dried forms in Khorambid.

No.	Components	Growing		Flowering	
		GC% (green/fr.)	GC% (dried)	GC% (green/fr.)	GC% (dried)
1	ϒ-terpinene	-	10.7	0.41	1.68
2	e-β-ocimene	2.32	2.7	0.4	0.4
3	limonene	-	55.1	14.6	-
4	terpinolene	9.6	0.6	8.08	3.8
5	α-phellandrene	-	0.3	4.15	2
6	indole	11.6	0.2	-	-
7	p-cymen-8-ol	6.2	0.2	-	-
8	bornyl acetate	1.2	8.5	-	-
9	α-pinene	-	0.6	41.36	24.2
10	methyl eugenol	-	0.5	0.27	0.01
11	caryophyllene	-	3	-	-
12	α-humulene	-	0.2	-	0.22
13	α-bisabolol	-	0.2	-	-
14	n-pentadecanol	5.5	0.3	-	-
15	ortho-cymene	2.4	-	0.9	-
16	δ-3-carene	45.9	-	34.6	7.71
17	acetophenone	2.3	-	-	-
18	e-caryophyllene	2.9	-	1.3	-
19	bornyl acetat	1.2	8.5	1.4	0.4
20	cis-2-tert-butyl-cyclohexanol acetat	-	-	-	0.04
21	myrcene	-	-	7.4	-
22	β-pinene	-	-	9.5	8.6
23	sabinene	-	-	4.7	1.5
24	camphene	-	-	2.8	0.031
25	e-nerolidol	-	2.27	-	-
26	β-bisabolene	-	2.47	-	-
27	β-phellandrene	-	-	-	4.4
28	allo-ocimene	-	0.9	-	-
29	α-thujene	-	0.2	0.3	0.3
30	α-terpinene	-	-	-	0.15
31	sylvestrene	-	-	-	1.3
32	isopentyl2-methyl butanoate	-	-	0.45	0.045
33	methyl eugenol	-	-	0.27	1.01
34	germacrene D	-	-	0.2	0.03

The results of chemical components analysis of essential oils in the growing and flowering stages of *Pr. ferulacea* from the Asopas site are shown in Table 6.

In the green/fresh samples from the Khorambid site, 12 and 24 chemical compounds were identified in the growing and flowering stages and for dried samples, 45 and 50 chemical compounds were identified, respectively. From the Asopas site, 38 components were identified in the green form of both stages and in the dried form, while 47 and 41 components were identified in the growing and flowering stages, respectively.

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Table 6 Some of chemical components of essential oils of *Pr. ferulacea* in green and dried forms in Asopas.

No.	Components	Growing		Flowering	
		GC% (green/fr.)	GC% (dried)	GC% (green/fr.)	GC% (dried)
1	ϒ-terpinene	6.11	13.25	1.3	0.7
2	α-terpinene	2.25	1.6	-	7.56
3	β-phellandrene	5.8	-	-	-
4	e-β-ocimene	1.68	-	1.29	1.32
5	3-thujanol	0.39	-	-	-
6	terpinolene	56.3	38.1	3.78	2.4
7	isopentyl isovalerate	4.7	-	0.43	-
8	1-terpineol	0.8	1.6	-	-
9	allo-ocimene	1.7	1.3	-	-
10	α-terpineol	0.5	0.4	0.04	-
11	β-pinene	0.3	-	0.03	15
12	bornyl acetate	2.96	1.8	-	-
13	e-Caryophyllene	4.7	3.6	-	-
14	ortho-cymene	-	2.2	8	0.01
15	α-phellandrene	-	6.2	2.7	0.56
16	z-β-ocimene	-	3.5	-	-
17	β-bisabolene	-	0.2	0.21	0.15
18	α-pinene	-	-	26.7	25.1
19	camphene	-	-	0.08	2.01
20	sabinene	-	-	5.4	1.4
21	myrcene	-	-	15.2	3.95
22	δ-3-carene	-	-	28.64	28.6
23	limonene	-	-	1.4	0.8
24	caryophyllene<(Z)->	-	-	2.06	-
25	terpinen-4-ol	0.2	0.5	-	-
26	acetophenone <para– methyl->	0.3	-	-	-
27	cymen-8-ol <para->	0.35	-	-	-
28	α-terpineol	0.5	0.4	-	-
29	verbenol <cis->	0.2	0.2	-	-
30	anisole <para-methyl->	0.19	-	-	-
31	β-pinene	0.3	-	-	-
32	thuj-3-en-10-al	0.4	-	-	-
33	bicyclogermacrene	0.2	0.35	-	-
34	eugenol	0.6	-	-	-
35	α-Humulene	0.2	0.2	-	-
36	caryophyllene oxide	0.2	0.1	-	-
37	α-bisabolol	0.3	0.1	-	-
38	n-pentadecanol	0.3	0.1	-	-
39	menthatriene <1,3,8-para->	-	1.1	-	-
40	octen-3-yl acetate <1->	-	0.5	-	-
41	limonene oxide <cis->	-	0.5	-	-
42	e-Nerolidol	-	0.5	-	-
43	bourbonanol <endo-1->	-	0.5	-	-
44	α-Cadinol	-	0.1	-	-
45	tricyclene	-	-	0.13	0.09
46	α-Thujene	-	-	0.15	0.3
47	bornyl acetate	-	-	1.01	0.06

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4 DISCUSSIONS

The main purpose of this research was to improve knowledge about *Pr. ferulacea* tensions under the influence of environmental factors, specifically variables of time and location. Evaluation of essential oils revealed that the amount of essential oils in the studied regions in the flowering stage is greater than in the growing stage, but there was no significant difference between them. In both the growing and the flowering stages, the amount of essential oils in the dried form was also higher than in the green/fresh form. The total amount of essential oils in the samples gathered from Asopas (where altitude and rainfall are higher than Khorambid) was 3% and 2% in the growing and flowering stage, respectively. *Pr. ferulacea* is considered as one of the, medicinal, foliage and industrial plant in rangelands. It has valuable and desirable foliage, especially because of its protein content. Ranchers evaluate the forage value of *Pr. ferulacea* as even higher than Medicago (Ahrar, 1970). Traditional ranchers collect green Prangos while it is toxic, then they dry the plant and use it to feed their livestock (Mozafarian, 1983; Moghimi, 2005).

Although there are several anti-quality (quality-lowering) factors in forage plants, only the changes in the amount and percentage of essential oil and its compounds in the growing and flowering stages were examined in this study to find out the reason for the desirability of *Pr. ferulacea* for livestock in the dried form and its undesirability in the green/fresh form. The most important identified components in Khorambid samples in the growing stage are carene-delta-3, indole, terpinolene, para-cymene-8-ol, n-pentadecanol and E-caryophyllene, (based on importance degree). In the flowering stage, important components include α-pinene, carene-delta-3, limonene, β-pinene, terpinolene, myrcen, sabinene, α-phellandrene and camphene. The most important identified components in the growing stage in dried form at the Khorambid site are limonene, gamma-terpinene, bornyl acetate and caryophyllene, E-β-ocimene,β -bisabolene and E-nerolidol.

The most important ingredients in Asopas in the growing stage and green formare terpinolene, gamman-terpinene, β-phellandrene, isopentyl 2-methyl butanoate, E-caryophyllen, bornyl acetate and α -terpinene; in the flowering stage they are delta-3-carene, α-pinene, myrcene, ortho-cymene, sabinene, α-phellandrene, terpinolene and Z-caryophyllene (based on importance degree). In the growing stage and dried form in Asopas, the most important components are terpinolene, gamma-terpinene, α-phellandrene, E-caryophyllene, Z-β-ocimene and ortho-cymene. The most important ingredients in the flowering stage in dried form from this site are delta-3-carene, α-pinene, β-pinene, α-terpinene, myrcene, terpinolene and camphene.

5 CONCLUSIONS

Sefidkon (2000) showed that the amounts of essential oils of *Pr. ferulacea* in the flowering stage and the dried form was 2.33% and also She reported 31 chemical components extracted from the aerial parts of *Pr. ferulacea*.. In present study the amount of essential oils in Asopas and Khorambid samples was 2.3% and 2.1%, respectively. Also 41 and 50 peaks of chemical components were identified in Asopas and Khorambid, respectively in the flowering stage (dried).(Sefidkon, 2000), while in this study 50 peaks in Khorambid and 41 peaks in Asopas were identified in the Some of the main components obtained in this study were the same.

In this study, the amount of essential oils in the growing stage in the dried form was higher than in the green/fresh form, which confirms the findings of Alikhah *et al.* (2008). However, in contrast to her view that the amount of essential oils in the flowering stage was greater

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in the green/fresh form than the dried form, this study showed the reverse. The differences in the results could be due to the use of different species in her study (*Pr. uloptera*) and the different study area (Alborz). The results of this study also showed that the amount of essential oils in *Pr. ferulacea* is greater than in *Pr. uloptera*.

This study showed that delta-3-carene and alpha and β-pinene (harmful components) reduced in the dried form of *Pr. ferulacea*. According to ethno-botany, this plant is traditionally collected by local ranchers and must be collected before the flowering stage. As in this study, Hoseini and Malekpour (2005) also identified α-pinene and β-pinene and delta-3-carene as the most important chemical components in *Pr. ferulacea*.

In contrast to the results of Amiri (2007), the highest amount of essential oils was obtained in the flowering stage. We identified the same chemical components reported by Amiri (2007).

Based on results, the harmful component myrcene in the flowering stage was 7.4% in the samples collected from the Khorambid area, while there was no found any evidence for myrcene in the dried form. According to these studies, it can be concluded that myrcene is a harmful component and an anti-quality (quality-lowering) factor in animal feed. This fact has been considered in ethno-botany in local ranchers and they collect the plant before the flowering stage. In addition to myrcene, the amounts of α-pinene, α-phellandrene and limonene in *Pr. ferulacea* are also decreased in the dried form. The compound α-pinene causes gall-bladder contraction, stimulation of skin, and mucus of the stomach, intestines and lungs (Clavarno, 1958). The compound α-phellandrene can cause diarrhoea and vomiting (Budavari, 1996). Limonene causes skin irritation and inflammation (Moini Naghani, 2006).

Due to the harmful effects of these components, ranchers avoid letting their livestock feed on the plant directly. Therefore, the analysis of chemical components revealed that α-pinene, α–phellandrene, limonene and especially myrcene are among the most important factors in reducing palatability of *Pr. ferulacea*. Nevertheless, these harmful components are used frequently in some industries. α-pinene is used in producing insecticides and perfumes (Mirza, 1996, Budavari, 1996). Limonene is used in production of food and drinks, perfumery, soaps and dilution colour (Moini Naghani, 2006). Anti-bacterial, anti-viral anti-fungal, anti-larval and insecticide properties have been reported for limonene (Moon and Mizutanil,, 2002). Delta-3-carene, one of the main components of the essential oils of *Pr. ferulacea*, has anti-microbial properties and is used in perfumery (Jaimand and Rezai, 2006).

Myrcene is used in the production of many aromatic chemicals and in preparation of an intermediate of vitamin E. Other properties include antibacterial and antispasmodic effects (Alikhah *et al.*, 2008). Alpha-phellandrene is also used in perfumery, (Budavari, 1996). Additionally α-pinene and β-pinene and delta-3-carene are mono-terpenoides, they can restrain tumour growth and reduce blood cholesterol.

Livestock are capable for learning from the consequences of prior grazing on the plants. Based on experience, livestock understand which plants cause bodily discomfort, and they avoid grazing on these plants. One of the important reasons for non-palatability of *Pr. ferulacea* in the green form may be livestock's previous experience of consuming it.

The results of Nazari (2001) indicated that the coumarin component in the green/fresh form of *Pr. asperula* caused digestive disorders in livestock. Razavi *et al.* (2008) have identified five coumarin components in the aerial parts of

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Pr. uloptera. Eshbakova *et al.* (2006) also identified four coumarin-like components in *Pr. ferulacea* in Turkey. Sagun *et al.* (2006) observed a high amount of coumarin in *Pr .ferulacea,* which this study also confirms it. In this study, it was observed that the thickness of the light green line (which is evidence of coumarin) was significantly greater in the flowering stage, which proves the accuracy of the local ranchers' choice of gathering time.

The presence of coumarin, which is a toxic substance, has been proved in the Umbelliferae family. Coumarin causes dermatitis and other disorders.

Considering the results of this research and of earlier studies, it can be concluded that α-pinene, myrcene, limonene, α-phellandrene, delta-3-carene and terpinolene (which were either absent or reduced in the dried form) are the harmful components and an anti-quality (quality-lowering) factor in feeding animals. This result matches precisely with the ethno-botanical approach of the ranchers in harvesting the plant and feeding their livestock.

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بررسی فیتوشیمیایی گیاه جاشیر (*Prangos ferulacea*) در رویشگاهی از زاگرس

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چکیده گیاه جاشیر .*Prangos ferulacea* (L.) lindl از خانواده چتریان (Umbelliferae) گونه غالب جاشیرزاران ایران در رویشگاه‌های کوهستانی زاگرس است. دانش بومی، این گیاه را در زمره بهترین گیاهان مرتعی ایران دانسته و از بروز تغییراتی کیفی در آن آگاه است. مرتعداران سنتی ایران، گیاه مذکور را در هنگام سبز بودن که برای دام سمی است، جمع آوری و پس از خشک شدن به دام می دهند. به منظور درک و آگاهی از تغییراتی که در ترکیبات این گیاه رخ می دهد، براساس مطالعات فیتوشیمیایی تاثیر متغیر زمان، مکان و نقش این متغیرها در بروز و نوع متابولیت های ثانویه این تحقیق صورت پذیرفت. در این راستا در چارچوب دانش بومی دامداران، مبتنی بر سمی بودن جاشیر درحالت سبز و ارزشمند بودن آن در حالت خشک، میزان و ترکیبات اسانس گیاه مذکور در مراحل رویشی و گلدهی درحالت تر و خشک مطالعه شد. نتایج نشان داد مقدار برخی ترکیبات مانند ترپینولن، بتا- فلاندرن و بورنیل استات نسبت به میزان آنها در حالت تر کاهش یافته و همچنین فقدان برخی از ترکیبات مانند آلفا و بتا پینن، میرسن و دلتا-۳-کارن در نمونه خشک باعث غیر سمی بودن گیاه شده است. این دستاورد تاییدی بر نظر دامداران است. کومارین نیز در مرحله گلدهی به میزان قابل توجهی بیشتر از میزان آن در مرحله رویشی بود که این امر موید کاربری درست و به هنگام دامداران می‌باشد.

کلمات کلیدی: ایران، ترکیبات شیمیایی، جاشیر، دانش بومی، زاگرس، فیتوشیمی

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