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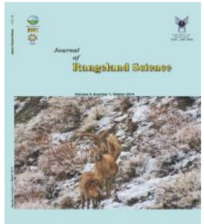

Research and Full Length Article:

Responses of Herbaceous Species to Fire in Persian Oak *(Quercus brantii*) in Coppice Forests

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Abstract. Zagros forests are one of the important natural ecosystems in Iran with high plant diversity and variety of plant communities. In recent decades, fire events have frequently occurred in some of these ecosystems. The purpose of this research is to investigate the composition and diversity of herbaceous species after nine years of fire occurrence in the forests of Zagros in western Iran. For this purpose in 2015, an area of 40 ha that had burned in 2006 was selected and compared with the unburned area (control area). In both areas, 80 plots were selected. The optimal size of plots was determined based on Whittaker's nested plot sampling and minimal area method. Then, vegetation cover percent of each herbaceous species was estimated according to Van der Marel criterion in each plot. The results showed that the fire reduced the diversity, evenness and richness indices, but this decrease was not significant between Shannon-Wiener ($P= 0.57$) and species density index ($P= 0.06$). Species *Avena fatua* with 21.51 and 18.56% had the highest coverage in the burned and control areas, respectively. In addition, the average of herbaceous percent cover was significantly higher in the burned area ($P<0.05$). Also, Fabaceae, Asteraceae and Poaceae families were the most important families in both areas. The overall results of this study revealed that many species are able to restore their primary conditions over time.

Key words: Disturbance, Diversity, Fire, Persian oak, Plant species composition

Introduction

Forests are the most important natural and renewable resources on the earth and their functions have a fundamental role in the ecological balance (Zhang and Chen, 2007). Various factors including climate changes, climate stability, habitat heterogeneity, competition, destruction, production and access to bioenergy can affect forest ecosystems (Currie *et al*., 2004). Destruction is one of the major functional components of ecosystems and is a common phenomenon in nature (Martin *et al*., 2009).

In forest ecosystems, natural disturbances such as wind, storm, natural fire, avalanche, massive movement, and pathogen factors are natural events that play a significant role in the dynamic and development processes and communities structure (Fleming *et al*., 2009). Fire as an inseparable part of natural ecosystems is an important factor in the destruction and regeneration in forest communities (Certini, 2005), which can be effective in vegetation dynamic, succession, composition, diversity and frequency of vegetation, structure and spatial distribution of plant communities according to intensity and frequency (Capitanio and Carcaillet, 2008; Pereira *et al*., 2011; Heydari *et al*., 2012). Overall, fire is a global problem that has attracted attention in relation to natural ecosystems and environment conservation (Mckenzie *et al*., 2011).

The effect of fire on vegetation has been recently studied and discussed in the world. Different responses have been found in ecosystems submitted to fire regimes (Vanschoenwinkel *et al*., 2013; Myers *et al*., 2015). Studies have shown that fire regimes affected plant diversity and species composition, leading to the reduced or increased plant diversity (e.g. richness and evenness) and changes in species composition according to natural conditions of forest ecosystems, intensity, frequency and occurrence time of fire (Valendik and Vekshin, 2005; Calabuing *et al*., 2006; Wanthongchai*et al*., 2008; Gonzales-Tagle *et al*., 2008; Herath *et al*., 2009; Haubensak *et al*., 2009; Scudieri *et al*., 2010; Bouchard and Pothier, 2011; Adel *et al*., 2013; Pourreza *et al*., 2014; Leverkus *et al.*, 2014; Burkle *et al*., 2015; Varma and Jayakumal, 2015; Mirzaei Mossivand *et al*., 2015; Tessler *et al.*, 2016; Ahmadi *et al*., 2017; Karimi *et al*., 2018). Although the effects of fire on forest ecosystems have been widely studied, its environmental effects on plant diversity, composition and structure are less studied, particularly in Zagros Oak forests in Iran (Pourreza *et al*., 2014; Heydari *et al*., 2016).

Annually, hundreds of fires occur in forest and grassland ecosystems in Iran (Salamati *et al*., 2011) so that a significant portion of these fires has been reported in Zagros forests in recent decade (Pourreza *et al*., 2009; Mohammadi *et al*., 2011). Forest covers 12 million hectares of Iran's area, of which about 5 million hectares are located in the western part of the country (i.e. the Zagros forest ecoregion). Zagros Mountains are the most important mountain ecosystems and biological resources with high richness of herbaceous species (Mogaddam *et al*., 2011; Mohajer, 2012; Heydari *et al*., 2011); those are situated from northwest to southeast in Iran. These forests are stretched for 1500 km in length and 400 km in width. Zagros is in the western Oak forest. *Quercus brantii* is the dominant species that forms predominant landscape along with other Oak species in these ecosystems (Marvi Mohajer, 2012). Natural and unnatural fires are the main factors for the destruction in Zagros forests influencing biodiversity and floristic composition of plant communities with death of many plant and animal species, removal of diebacks, litters and organic soil matter and the destruction of the nutrient cycle (Heydari *et al*., 2011; Pourreza *et al*., 2014; Hamzehee *et al*., 2008; Fattahi, 1994;

Salehi *et al*., 2011; Costa *et al*., 2012; Jahantab *et al*., 2010; Pang *et al*., 2012). Due to high risk of fire in the young forests, coppice and even age as compared to the old and uneven age forests, Zagros forests as a coppice and even-aged are continuously sensitive to fire (Jazirehei and Ebrahimi Rostaqi, 2005). These ecosystems are a valuable source of environmental services including water and soil conservation, economic and social issues and livelihoods of local people in the west of Iran. Therefore, efficient study and understanding of vegetation and plant species diversity after the fires are necessary for appropriate planning and management. Moreover, conservation, management and suitable exploitation of herbaceous require scientific knowledge, and due to lack of vegetation study and diversity of herbaceous species, there will not be the possibility of planning principles for these ecosystems.

Hence, the objective of this study was the survey of herbaceous species responses to fire in the Zagros coppice forests in western Iran. The results of this study can be helpful for development and implementation of sustainable management in these forests at local and regional scales.

Materials and Methods

Study area

This study was done in the Bazaz Khane strait of the Kermanshah province, west of Iran at longitude 47° 17' 5" to 47° 16' 15" E and latitude 34° 23' 13" to 34° 22' 36" N (Fig. 1). The area is mainly characterized by south-facing slopes. Mean annual precipitations and temperature are 429 mm and 28.6°C, respectively. Based on the Emberger climate classification, the climate is moderate semi-humid. Slope ranges from 30 to 40% and the mean elevation is 1374 m. a.s.l. The horizons of mother material include soft sediments with pebbles and calcareous mother stone. The Bulk densities of the soil and the mean ones are 0.59 and 67%, respectively (Gholami and Sayad, 2015). The forests burned superficially (with low intensity) at the end of September in 2006 because of the presence of dried herbaceous species on forest floor. This region was dominated by *Quercetum persicum* community and *Quercus brantii* was main species in coppice form due to the destruction which has been caused by heavy pressure of livestock grazing, girdling, and excessive cutting of trees and shrubs to supply fuel wood. *Crataeg aronia* var. *minuta* and *Cerasus microcarpa* present with low frequency. Also, annual and perennial herbaceous species and grasses form floor storey in this forest region. Of course, the dominant coverage of herbaceous species was higher than annual species.

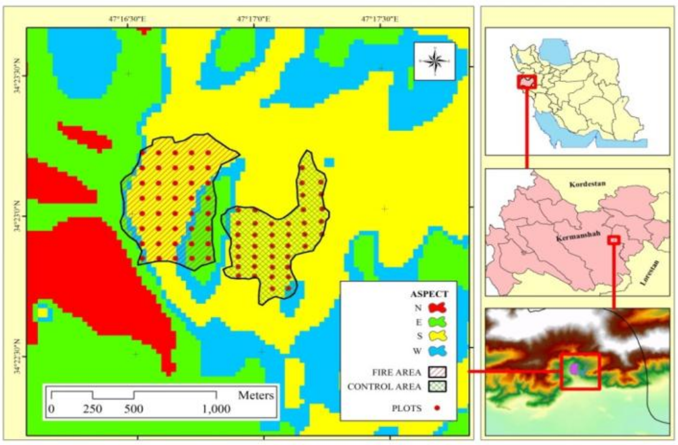

Fig. 1 Study area location (Bazazkhaneh Strait forest area) in Kermanshah Province

Research Method

Sampling was carried out in 2015 after 9 years of fire event (a period of 9 years) at the beginning of the growing season. We surveyed 40 ha of burned area and 40 ha of unburned (control) area to compare herbaceous diversity in burned and unburned areas. The control area was adjacent to the burned area with observance of proper distance. Both areas were selected by the most homogeneous ones and were similar in terms of elevation, slope and aspect. Systematic random sampling method used to survey 40 circular plots in each area. Also, we used the Whittaker's nested plot sampling and minimal area method to determine a plot size (Whittaker, 1956). This resulted in plots of 8 m^2 being sampled for herbaceous species measurements. In each established plot, the type and percent cover of each herbaceous species was estimated according to Van dermal frequency- dominance criterion (Table 1) (Zakeri Pashakalaee *et al*., 2015). Collected samples were dried and transferred to Herbarium of Research Center for Agriculture and Natural Resources in Kermanshah province. All herbaceous species were identified by Iranica (Rechinger, 1963- 2010), Iran (Assadi *et al*, 1991- 2011), Turkey (Davis, 1965- 1985) and Iraq (Townsend and Guest, 1974) floras. Eventually, the life form of species was classified by Raunkiaar classification method (Raunkiaer, 1934).

Table 1. The classifications of species cover percent according to Van der Marel criterion

Class	Coverage (%)	Average (%)
1	<0.5	0.50
2	0.5-1.5	1.00
3	1.5- 3	1.75
4	3-5	2.50
5	5-12.5	8.75
6	12.5- 25	18.75
7	25-50	37.50
8	50-75	62.50
9	>75	87.50

Biodiversity Indices

To investigate herbaceous species diversity in each area, different indices including Shannon–Weiner diversity index (H'), species richness (S) and Smith-Wilson's evenness index (E_{Var}) were calculated (Krebs, 1999).

Data Analysis

Kolmogorov– Smirnov test was used to study the normality of data distribution. To detect differences in diversity indices between the burned and unburned areas, student t-test was used in the case of normally distributed data while the non-parametric equivalent (Mann-Whitney U-test) was applied to other cases. Statistical analysis was conducted using the SPSS software version 22.0. In addition, Ecological Methodology for Windows software, version 6.0 was used to calculate biodiversity indices (Krebs, 1999).

Results

The results indicated that totally 59 herbaceous species belong to 43 genera and 16 families were found in both areas. 48 species of 14 families belonged to burned area, and 50 species of 13 families were found in the unburned area. Some species including *Minuartia hamata*, *Cerastium inflatum*, *Hypericum perforatum*, *Gladiolus atroviolaceus*, *Malva neglecta*, *Trigonella strangulata*, *Lagoecia cuminoides*, *Campanula strigosa*, and *Serratula latifolia* were only present in the burned area whereas *Papaver macrostemum*, *Tragopogon buphthalmoides*, *Salvia macrosiphon*, *Sameraria stylophora*, *Zoegea purpurea*, *Alyssum stapfii*, *Salvia multicaulis*, *Picris strigosa*, *Turgenia latifolia*, *Malablia porphyrodiscus*, and *Serratula cerinthifolia* were only found in the unburned area. In both areas, Asteraceae, Fabaceae and Poaceae families had the highest frequency (i.e., number of species) whereas some of families only had one genus and species. Hypericaceae, Malvaceae, Caryophyllaceae and

Iridaceae each had one species (1.6 %) and only were found in the burned area (Fig. 2).

The cover percent of many species was significantly higher in the burned area ($p \leq 0.05$). In the burned area, the highest cover percent was recorded for *Avena fatua* (21.51%), *Aegilops triuncialis* (19.21%), *Bromus danthoniae* (17.06 %), *Bromus tectorum* (13.32%), *Poa bulbosa* (11.43%), *Campanula cecili* (11.42%) and *Trifolium pilulare* (11.09%). In addition, in control area, the highest cover percent belonged to *Avena fatua* (18.65%), *Bromus tectorum* (12%), *Aegilops triuncialis* and *Serratula cerinthifolia* (11.78%) (Table 3).

The range of life forms indicated that the highest percent of life forms belonged to therophytes with 83.38% and 80% in the burned and unburned areas, respectively. Hemicryptophytes with 12.5% (6 species) and 14% (7 species) and Cryptophytes with 8.33% (4 species) and 4% (2 species) were present in the burned and unburned areas, respectively (Table 3).

The results of diversity indices in the burned and unburned areas were shown in Table 2. The results indicated that E_{Var} was significant at 5% level while no significant differences were seen between both areas for H′ and species richness (S) index.

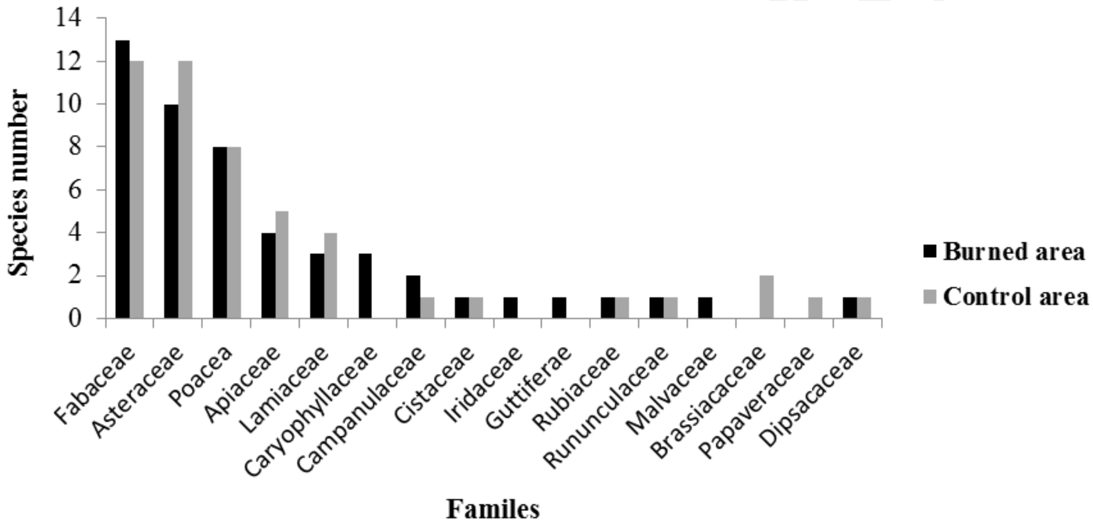

Fig. 2. Richness of plant species based on different families in study areas

Table 2. Mean and standard error of diversity indices in herbaceous layer in study areas

Plant diversity	Indices	Burned area	control	*P*- value
Diversity	Shannon-Weiner	2.696± 0.073	2.936± 0.022	0.570 ns
Evenness	Smith and Wilson	0.412± 0.022	0.475± 0.023	0.000*
Richness	R=S	12.97± 0.10	13.85± 0.10	0.063ns

*= significant at 5% probability level. ns=non-significant

Table 3. Life forms, average relative cover and relative frequency in the burned and unburned areas

Taxon	Life forms	Average cover (%)		Frequency (%)		*P*-value
		Burned	Control	Burned	Control	
Apiaceae						
Lagoecia cuminoides L.	Thr	1.92	0	2.5	0	-
Malablia porphyrodiscus Stapf & Wettst.	Thr	0	3.36	0	2.5	-
Scandix stellata Bank & Soland.	Thr	0.39	3.17	2.5	22.5	0.006*
Scandix pectin-veneris L.	Thr	0.39	0.85	2.5	2.5	0.000*
Torilis leptophylla (L.) Reichenb.	Thr	3.39	3.47	70	80	-
Turgenia latifolia (L.) Hoffm.	Thr	0	3.36	0	2.5	-
Asteraceae						
Anthemis schizostephana Boiss.	Thr	6.31	1.97	10	7.5	0.000*
Carduus pycnocephalus L.	Thr	1.52	3.08	10	30	0.029*
Crupina crupinastrum (Moiss)Vis.	Thr	1.51	2.05	30	40	0.000*
Echinops ritrodes Bunge.	Hem	2.25	2.83	10	25	0.086^{ns}
Picnomon acarna (L.) Cass.	Thr	5.11	3.93	10	67.5	0.002*
Picris strigosa M.B subsp. strigosa	Hem	0	0.27	0	2.5	-
Serratula latifolia Boiss. Diagn. Pl. Or.	Cry	7.11	0	12.5	0	-
Tragopogon buphthalmoides (D.C) Boiss.	Hem	0	0.87	0	25	-
Tragopogon longirostris Bischoff ex Sch. Bip	Hem	1.75	3.32	25	15	0.000*
Urospermum picroides (L.) Desf.	Thr	4.77	6.29	65	85	0.000*
Zaegea purpurea Fresen.	Thr	0	0.49	0	5	-
Chardinia orientalis (L.) O. Kuntze	Thr	9.71	4.97	20	55	0.006*
*Serratula cerinthifolia (*SM.*)* Boiss*.*	Hem	0	11.78	0	2.5	-
Brassicaceae						
Alyssum stapfii Vierh.	Thr	0	1.15	0	2.5	-
Sameraria stylophora Boiss	Thr	0	8.14	0	5	-
Campanulaceae						
Campanula cecili Rech. F.&.Schimn-Cseika	Thr	11.42	5.4	2.5	5	0.006*
Campanula strigosa Bank & Soland	Thr	1.98	0	2.5	0	-
Cistaceae						
Helianthemum ledifolium (L.) Miller var. *ledifolium*	Thr	6.32	7.19	62.5	50	0.000*
Caryophyllaceae						
Cerastium inflatum Linkex Desf.	Thr	4.28	0	2.5	0	-
Minuartia hamate (Hausskn.).	Thr	1.37	0	2.5	0	-
Velezia rigida L.	Thr	4.46	6.13	5	2.5	0.000*
Dipsacaceae						
Pterocephalus plumosus Coult.	Thr	3.49	5.64	17.5	25	0.000*
Fabaceae						
Lathyrus cicera L.	Thr	3.01	0.91	37.5	15	0.013*
Medicago radiatata L.	Th	4.28	2.29	2.5	12.5	0.000*
Medicago rigidula (L.) All.	Th	3.62	4.89	65	50	0.009*
Trifolium angustifolium var.	Th	8.83	7.23	70	75	0.000*
Trifolium bullatum Boiss. & Hausskn.ex Boiss	Thr	4.04	3.06	60	20	0.007*
Trifolium campestre Schreb.	Thr	4.3	4.26	60	22.5	0.000*
Trifolium dasyurum C. Presl	Thr	2.67	3.87	57.5	55	0.000*
Trifolium echinatum	Thr	9.24	3.79	50	32.5	0.01*
Trigonella filipes Boiss.	Thr	6.44	2	72.5	62.5	0.032*
Trigonella macroglochin Duriea	Thr	5.19	4.89	10	2.5	0.000*
Trifolium pilulare Boiss.	Thr	11.09	2.77	55	32.5	0.002*
Trifolium stellatum L. var. *stellatum*	Thr	1.95	2.95	42.5	12.5	0.002*
Trigonella strangulata	Thr	0.41	0	2.5	0	-
Guttiferae						
Hypericum perforatum Boiss & Hausskn.	Hem	0.64	0	2.5	0	-
Iridaceae						
Gladiolus atroviolaceus Boiss.	Cry	2.86	0	10	0	-

Taxon	Life forms	Average cover (%)		Frequency (%)		*P*-value
		Burned	Control	Burned	Control	
Lamiaceae						
Salvia macrosiphon Boiss.	Hem	0	1.19	0	2.5	-
Salvia multicaulis Vahl	Hem	0	0.85	0	2.5	-
Ziziphora capitata L. sub sp. *orentalis* Samuelsson	Thr	5.8	6.15	7.5	2.5	0.000*
Ziziphora tenuior L.	Thr	4.56	1.02	5	7.5	0.000*
Malvaceae						
Malva neglecta Wallr.	Hem	0.83	0	2.5	0	-
Rununculaceae						
Nigella oxypetala Boiss.	Thr	2.53	2.04	12.5	17.5	0.000*
Papaveraceae						
Papaver macrostemum Boiss.	Thr	0	0.34	0	5	-
Rubiaceae						
Callipeltis cucullaris (L.) Steven	Thr	1.42	6.07	2.5	15	0.047*
Poaceae						
Avena fatua L. var.*fatua*	Thr	21.51	18.65	62.5	82.5	0.000*
Aegilops triuncialis L.	Thr	19.21	11.78	50	47.5	0.000*
Bromus danthoniae Trin. var. *danthoniae*	Thr	17.06	4.31	10	22.5	0.000*
Hordeum bulbosum L.	Cry	8.29	7.41	45	27.5	0.000*
Lophochloa berythea (Boiss & Blanche) Bor	Thr	7.98	10.57	15	22.5	0.000*
Poa bulbosa L. var.*vivipara* Koel	Cry	11.43	8.03	12.5	47.5	0.049*
Taeniatherum crinitum (Schreb.)	Thr	5.97	2.83	5	5	0.000*

Thr = Therophytes, Hem= Hemicryptophytes, and Cry = Cryptophytes

Discussion

The results indicated that the values of diversity, richness and evenness were higher in the unburned area than the burned one. The fire time as an effective factor had different impacts on biodiversity and vegetation cover. Zagros forests with open plant cover and arid and semi- arid climate are susceptible regions for fire occurrence in summer season. In this season, fire can have the highest effect on vegetation cover and soil because of soil dryness.

Results showed that species richness was higher in control area than the burned one. The decrease of species richness has been shown in some studies. Extreme heat caused by fire can remove or damage some species with superficial seeds or change physical and chemical properties of soil, which eventually leads to the reduction in species richness (Esque *et al.*, 2010). Also, Fire can decrease the possibility of seed establishment of neighboring regions by reducing the seed density and soil permeability (DeFalco *et al.*, 2009). Statistical analysis for diversity indices indicated that H´ and the number of species (S) values did not show any significant differences (Table 2); it can be a result of forest return to its initial conditions because of a 9 year temporal interval of fire occurrence until now. These results are reported inconsistency with the results of some studies (Lahav, 1989; Fearnside, 2005; Chuvieco and Salas, 1996; Goudelis *et al.*, 2004; Rabinovich, 1982; Banj Shafiei and Akbarinia, 2006).

The study of evenness indices also indicated that this value was decreased after fire. Evenness is a value which indicates the balance in species abundance. Actually, evenness will be maximized when all of species have equal frequency. Fire can cause change the pattern of species dominance. After fire occurrence, the balance of species richness will be decreased by the elimination of sensitive species and dominance of resistant species to fire with high frequency and adaptation to new environmental conditions. In this regard, Banj Shafiei and Akbarinia (2006) have reported similar results.

In this study, herbaceous species can be classified in three groups according to the presence and absence. First group includes some species which were only present in the burned area with 18.75% of all species on this area (9 species) (Table 3). Fire can provide necessary potential to germination of new species in the environmental condition by variations in access to resources such as light, increase the speed of decomposition because of an increase in soil temperature, and create appropriate space due to the elimination of biomass and forest floor litter (Davis *et al*., 2000). Second group was species that were common between both areas with 66.1%. It should be noted that the restoration of plant cover composition and diversity needs a period over four years. Tahmasi (2013) observed that the 4-year break after the fire was an important factor in the revival of plant species and is consistent with our research results. It is likely that herbaceous species have had necessary opportunities to recovery in environment conditions after nine years of fire occurrence. Therefore, the plant potential to restoration after fire depends on the community's ability to resistance to fire, and regrowth of healthy remaining parts of plants or establishment of viable seeds. The third group was species which were only present in the unburned area with 22% of all species in this area. These species were removed of burned area due to the effect of competition.

The cover percent of Hemicryptophytes was lower in the first group (dominated species in the burned area) than third group (dominated species in the unburned area). Fire is one of the main reasons to decrease Hemicryptophytes whereas the cover percent of Therophytes and Cryptophytes was increased. These life forms are resistance to fire due to their seed and bud position under soil. The results reported by Ortman and Bran (2008) confirmed the resistance of Therophytes and Cryptophytes species to the fire due to their location on the soil.

The results showed that Asteraceae, Fabaceae and Poaceae had the highest number of species and were dominant families (Fig. 2). Moreover, according to frequency distribution models, herbaceous species belonging to these families had the highest values of frequency and dominance in the burned and unburned areas. Appropriate edaphic condition as well as high rate of disturbance can lead to high frequency of these species. Razavi (2008) reported that the fire caused the increased plant species of the Asteraceae family due to high degradation in the area.

Species belonging to these families, especially Asteraceae can be dominated in unfavorable conditions by wide tolerance and fast growth of seeds. Thus, the major presence of Asteraceae family indicates degradation and pressure on ecosystem. That should be a warning for the region. Davis (1965-1985) reported that the cause of an increase in plant species of the Asteraceae family in condition of destruction was fast becoming green of the seeds of this family. In this regard, it is in agreement with the result of our research.

The species cover percent in the burned area was significantly higher than unburned area (Table 3). This difference may be due to the invasion of annual species (Therophytes) and opportunistic dominant of such grasses as *Avena fatua*, *Aegilops triuncialis*, *Bromus danthoniae*, and *Bromus tectorum* as invasive species is considerable which has led to increase herbaceous cover percentage. Based on the results of Jamshidi Bakhtar *et al*. (2013) research, the increased vegetation percent due to dominance of annual species has been reported. Fire can provide suitable condition for annual species growth by reducing the canopy cover in upper storey, burning litter on the forest floor (keely *et al*., 2003; Chaneton and Facelli, 1991). The frequency of therophytes species was the highest value in the burned area. Fire can increase the dominance of therophytes in the burned area. The species belonging to this life form may be able to complete their growth cycle in a short time and produce lots of seeds. This result is consistent with the results of some investigators (Siahmansour *et al*., 2016; Heydari *et al*., 2016; Pourreza *et al*., 2014; Mirdavodi *et al*., 2013; Knnap and Seastedt, 1986) in terms of increasing the Therophytes plants from the fire.

Conclusion

Forest ecosystems in western Iran are affected in various ways. Fire can create negative effects on ecological processes and reduce stability of ecosystem. The overall results of this study indicated that diversity components including richness and evenness was lower in the burned area than the unburned one, but these variations weren't considerable and also the dominant type of herbaceous species in both areas belonged to annual species. It should be noted that many species are capable to restore their primary conditions over time; it can be concluded that the burned area has necessary potential to return toward secondary succession levels. In other words, the forest has been partly restored within nine years after the fire and the implementation of proper management activities in the region is accompanied by reducing the destruction and preventing possible future fires. These measures include: 1) Prescription fires in the region as it was said that the forage area is a fire extinguishing agent on the forest floor since dry fodder on the forest floor in the warm seasons is one of the main factors in the creation and spread of fire in Zagros forests, so this theme topic should be prioritized by the operating system. 2) Improving firefight equipment to expedite the process of fire suppression and to reduce damage to the forest (that has never been used in the Zagros forest). 3) Offering the firefighting training to people who live in forests and villages nearby in order to carry out initial measures to reach the relief forces that reduce the damage to the forest. 4) Exact protection of the area after burning since forest as a natural ecosystem has self-regulating properties, the passage of time and the reduction of human interference and destruction are important factors in its reconstruction. Also, it is recommended that such studies can be carried out in the short and long-term periods after the fire along with the study of vegetation and soil factors in order to determine the potential for rehabilitation of these areas based on phytogeocenoses.

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پاسخ گونه‌های علفی به آتش‌سوزی در جنگل‌های شاخه‌زاد بلوط ایرانی(***Quercus brantii* L.**)، کرمانشاه، ایران

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چکیده. جنگل‌های زاگرس با تنوع گونه‌ای بالا و جوامع گیاهی متعدد جز مهم‌ترین اکوسیستم‌های طبیعی ایران محسوب می‌شوند، اما متاسفانه در دهه‌های اخیر آتش‌سوزی‌های زیادی در این جنگل‌ها رخ داده است. هدف از این تحقیق بررسی ترکیب و تنوع گونه‌های علفی بعد از وقوع نه سال از آتش‌سوزی در جنگل‌های غرب ایران است. بدین منظور در سال ۱۳۹۴، منطقه‌ای به مساحت ۴۰ هکتار که در سال ۱۳۸۵ دچار آتش‌سوزی شده بود انتخاب و با منطقه شاهد با همان وسعت مقایسه شد و در مجموع ۸۰ قطعه نمونه برداشت شد. برای نمونه‌برداری از روش پلات‌های حلزونی ویتاکر و سطح حداقل برای تعیین اندازه بهینه قطعات نمونه استفاده شد. بنابراین در هر پلات درصد پوشش هر یک از گونه‌ها با استفاده از معیار وان درمال تعیین شد. نتایج نشان داد که آتش‌سوزی باعث کاهش شاخص‌های تنوع- یکنواختی و غنا شده است اما این کاهش بین شاخص‌های تنوع شانون- وینر (P= 0.57) و شاخص تراکم گونه‌ای (P= 0.063) معنی‌دار نبود. گونه *Avena fatua* در هر مناطق آتش‌سوزی شده و شاهد به ترتیب با ۲۱/۵۱ درصد و ۱۸/۵۶ درصد بیش‌ترین درصد پوشش گیاهی را داشت. علاوه بر این، میانگین درصد پوشش علفی در منطقه آتش‌سوزی شده به طور معنی‌داری بیش‌تر بود (P<0.05). همچنین خانواده‌های Fabaceae، Asteraceae و Poaceae جز مهم‌ترین خانواده‌ها در هر دو منطقه بودند. نتایج کلی این مطالعه نشان داد که بسیاری از گونه‌های علفی قادر به احیا شرایط اولیه خود در طول زمان هستند.

کلمات کلیدی: آشفتگی، تنوع، آتش، بلوط ایرانی، ترکیب گونه‌های گیاهی