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ORIGINAL ARTICLE

An investigation on the effect of fire on main particulars in woodland (Case study in Veysian – Lorestan)

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ABSTRACT
Fire as a factor has influence on natural ecosystems from burning plants till Changing Succession, plant Source, and natural cycles of species. This project was established to deal with the effect of fire on quality and quantity of habitat in rangelands that are object of Study. A 2500-hectares burnt land, located in the heights of Veysian, was selected for the study. The key area was determined and a total of four line transects with200 meter length, were created each. Ten stationary one square meter quadrats on each transect formed one of the sample units in control and burnt area in each year. The results show that the average of treatments, canopy cover, litter, stone, and bare soil in the fire control area have significant meaning with one percent. The comparison average based on different growing form and palatability show density, production, canopy cover which density in palatability middle class have significant meaning between treatment and control five percent , and from production growing form. Forbs , and grasses one and five percent in fire and Control area and canopy cover in growing form of forbs and grasses have significant meaning . (p<0.05&0.01). The Class II Plants have Significant meaning from Production and density with 5 and 1% in two area. Invasive plant have significant meaning from production and canopy cover with 1%.
Key words: *"fire " , "woodlands ", "growing form ", "production ", "density ", "canopy cover ".*

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INTRODUCTION

Today, second to human activities (either urban or agricultural) conflagration is the most common cause of destruction of natural ecosystems situated in lands [48]. Fire affects natural ecosystems by burning plants, and changing sequence patterns and plant resources. Town and Ohlenbush (1992) introduced fire as the most important and economic means of bush management [28]. On the other hand, in 2004 Fuhlendorf and Eagle asserted that fire management tools and grazing rate in shrubberies relatively increase the production of forage and diversity. In 1962, Humphery declared that some species are highly susceptible to conflagration and cannot recover from it unless through seeding. However, generally the role of controlled conflagration or flammable materials in the development of grass or destruction of woody vegetation is very well documented at the universal level [22, 13, 7, 32, 20, 18, 24]. In some cases conflagration leads to reconstruction of roots and proper settlement of collars and toes [42]. Fire eliminates undesirable and spiny plants and helps rangelands gain power to host livestock [10]. Moreover, conflagration leads to an increase in the quality and protein of forage, its palatability, digestibility, and accessibility as well as elimination of litter in the beginning of the growing season [26, 39]. However, the influence of fire on the production of different habitats varies depending on the habitat. It can reduce rangeland species and leave adverse effects on the quality of soil [36]. In some cases it can provide the chance for an increase in plant production and seed dispersal as well as a decrease in plants competition [34]. The achievements caused by conflagration have turned it to a management technique that is widely used to achieve various goals [23]. As a result conflagration is used as an inexpensive means of controlling undesirable factors in rangelands [44]. With its various consequences, fire is considered to be one of the inexpensive and substantial means of managing rangelands [46]. In addition, it contributes to the distribution of livestock in habitats covered with fodders and roughages and spiny species [2]. However, the effects of conflagration on soil are usually considered to be negative because fire reduces nutrients in the affected soil and ecosystem [4]. In addition, it also drastically reduces soil fertility [6, 22]. In any event, depending on its scale, fire has different natures and environmental consequences [22]. Few studies have been conducted on such relationships in different ecosystems as a result of changes of attitudes to the relationship of man with animals, grazing behavior of animals, and the interaction between animals and soil and forage in grasslands [31]. According to the references and experiments, fire has various effects on ecosystems. Therefore, analysis of the effect of fire on plant species in different habitats is of research value and its results can be used to decide on the implementation of this method as a means of breeding rangelands on ecologic areas. Some of the results of such an analysis are discussed in this manuscript.

MATERIALS AND METHODS

The study area was situated in the vicinity of Veysian County, one of the subsidiaries of Lorestan Province, with longitude of 48°00′34″ and latitude of 33°26′16″. According to the latest statistics of the Meteorological Burea of Lorestan Province, the mean altitude of the site is 1520 m and the mean precipitation rate in the area is 536.4 mm. The typical plant growing in the site is Coronilla scorpoides - Aegilops cylindrica. These rangelands are used as pastures for the livestock of nomads. They are also of use for inhabitants of villages that raise goat and sheep. The distance between the sampling site and the stock watering tank was 2.5 km. A 2500-hectares burnt land, located in the heights of Veysian, was selected for the study. The key area was determined and a total of four 200-m transects were created each. Ten stationary one square meter quadrats on each transect formed one of the sample units. An area next to the study area, which was not damaged by conflagration, was also selected as the congruent are (Fig. 3). The sample units included four 200-m2 transects accommodating 10 one square meter plots which formed the control area. In the context of this research, production refers to the germination of plants in the growing season under study by employing precise methods of cutting, balancing and concentrating plants. The basic numbers of plants per area unit (inside of plots) and canopies were obtained by calculating the perpendicular cross sections of plants. In this study, the statistic population included four 200-m transects with ten one square meter plots that are situated every 20 meters. A total of 40 plots existed in the study area and four 200 meter transects existed in the control area (containing 40 plots annually). Samples were taken from the site from 2012 to 2013. In sum, 80 one square meter quadrats were studied each year and a total of 320 plots had been studied by the end of the research. All of the parameters in the study area were measured as well. Following the sampling phase data was normalized using the natural logarithm (LN) and was analyzed using the T-TEST and ANOVA analysis method. A comparison was also drawn between the data using the DUNCAN method [19, 33, 45, 41]. Results of the aforementioned analyses and comparisons are presented in the following section.

Figure (2): New growth of *Quercus persica* after fire

Figure (1): Burnt area and micro trass lines

Figure (4): *Hordeum bulbosum* and fire resilience

Figure (3): View of control and burnt area

RESULTS

Table (1): The one-way analysis of variance (ANOVA) performed on major index plants in control and burnt areas from 2012 to 2013

S.V	F	M.S	S.S
Density	3	822/31	^{ns} 467/95
Error	176	822/19	260/3499
Total	179		729/3594
Production	3	501/15532	**503/46597
Error	323	504/1648	643/532466
Total	326		146/57064
Canopy Cover	3	18179/365	**095/54538
Error	628	237/759	893/149312
Total	631		03850/987
Litter	3	7395/302	**907/22185
Error	628	144/629	117/90827
Total	631		024/113013
Stone & Pebble	3	4691/948	**843/14075
Error	628	88/269	195/55433
Total	631		038/69509
Bare soil	3	21503/216	**64764509/
Error	628	170/423	921/107025
Total	631		568/171535

** Significant (p<0/01).
Ns: not significant.

Table (2): Comparison of major factors in both areas by year using the Duncan multiple range test

Year	Treatment	**Mean of factors**					
		Density	Production gr/m^2	Canopy Cover%	Litter %	Stone & Pebble%	Bare soil %
2012	Burnt	8/3	b 3/39	b 55	c 8	a 17	a 24
	Control	7	a 121/6	a 66	a 21	c 8	b 5
2013	Burnt	4/2	b 39/9	b 48	b 12	b 14	a 26
	Control	7/6	5 A/ 145	a 69	a 22	d 5	4 B

Table (3): Comparison of concentration factors, production and canopy based on the growth form and palatability classification in the control and burnt areas

S.V (growth & palatability)			S.D ± M	Sig Level
Growth form	Factors	Treatment		
Herbal Forbs	Density	burnt Control	0/7938 ±/8205/3 0/60141 ±3/1458	n.s
	Production	burnt Control	1/000 ±10/3045 2/81±16/2689	p<0/05
	Canopy Cover	burnt Control	0/07533±2/1497 0/06726±1/9284	p<0/05
Grasses	Density	burnt Control	4/886±5/1852 4/5819±6/611	n.s
	Production	burnt Control	1/18781 ±8/9431 9/24392±56/6588	p<0/01
	Canopy Cover	burnt Control	0/93047±2/0674 0/95368 ±2/9658	p<0/01
Spiny Forbes	Density	burnt Control	2/02747 ±2/4167 0/34157 ±1/1250	p<0/05
	Canopy Cover	burnt Control	0/81186±1/0418 0/48586 ±1/2359	n.s
I Decreaser	Density	burnt Control	0/000 ±1/000 1/0647 ±3/7368	p<0/05
	Production	burnt Control	1/83791 ±8/8395 2/38262±12/4708	n.s
	Canopy Cover	burnt Control	1/0153±2/0914 0/8815±2 /0159	n.s
II Increaser	Density	burnt Control	0/000±/000 1 0/000±3/000	p<0/05
	Production	burnt Control	0/000 ±1/000 21/29687±37/2000	p<0/01
	Canopy Cover	burnt Control	0/000±0/6931 1/14508 ± 2/9355	n.s
III Invader	Density	burnt Control	0/65397 ±4/6441 0/59584 ±4/9310	n.s
	Production	burnt Control	0/8497±10/3787 6/47391 ±43/1094	p<0/01
	Canopy Cover	burnt Control	0/99681±2/1456 1/09068 ±2/5007	p<0/01

Results of the one-way analysis of variance of the Veysian site indicate that there are significant differences between the average amounts of production, canopy, litter, rock and pebbles and bare soil in the control and burnt areas at the significance level of 1% (Table 1). Moreover, comparison of the average concentration, production and canopy based on different growth forms and palatability classes indicates that there is a significant difference between the concentrations of the intermediate classes of palatability in the control and experiment areas. Considering production based on growth form, there was a significant mean difference between the productions of herbaceous forbs and grasses in the control and experiment areas at significance levels of 5 and 1%. The same case applies to canopies in the growth forms of herbaceous forbs and grasses. Considering palatability classes, class I plants of the two areas do not demonstrate any significant difference except in the case of concentration. However, class II plants or average plants of the two groups demonstrate significant differences at significance levels of 5 and 1%. Invasive plants of the two groups also show significant differences in terms of production and canopy at a significance level of 1% (Table 3).

DISCUSSION AND CONCLUSION

Results indicated that conflagration causes substantial changes to the structure of habitats. That is to say, it reduced annual average canopy from 67.5 to 49. 5, in the time span between 2012 and2013. It increased the annual average of other negative factors (including bare soil) from 4.5 to 25% (5 times). Therefore, it increased the vulnerability of soil to erosion. Analysis of the amount of litter also revealed that the average amount of litter (21.5%) in the control area is enough to protect the soil because of the vegetation of the area. However, from 2012 to 2013 the litter was decreased from 8% to 12%. Hence, a total of 32% of the vegetation influencing splash erosion is lost. Consequently, fire can make substantial changes to the composition of important soil surface factors [14, 47, 29, 35, 15]. According to the statistics, in the control area the average annual production was reduced from 133.6 g/m2 to 36.6 g/m2. In addition, in the short run the production rate was reduced by 27% of the average production of the control group. This finding was reported by 16, 11, and 40 as well. Large-scale conflagration can severely affect the quality and livelihood of beneficiaries. Statistics also indicate that fire in this habitat has change the amount of rocks and pebbles. That is to say, the average amount of rock and pebbles in the control area has increased from 6.5% to 15.5%, which reflects the potential of this area for producing more runoff as a result of autumn and spring showers. Hence, in steep terrains covered with one-year-old vegetation, conflagration requires more precision and preparedness. Analysis of the changes of the herbal composition by different dominant growth forms indicates that perennial grass forms experience a 50% reduction in concentration compared to the control forms. The trend is intensified in the production of this growth form, which is composed of perennial and annual species. That is to say, the average production of growth form in the control area (96.85 gr/m2) is reduced by 82% (12.4 gr/m2). However, canopies are not excluded from the process. For example, the average production of canopy is reduced from 43% to 15.5% in the burnt area. The values of decline in the growth form of herbaceous forbs was smaller but in sum the product of these productions is reduced to about 10 gr/m2. The canopies in the area also are reduced proportionally. Similar results have been published by 27, 3 and 46.

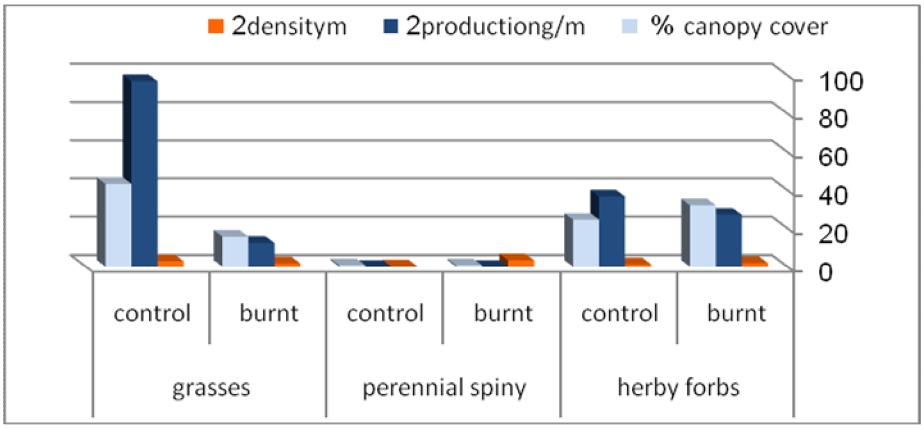

Figure (5): The diagram of variations of important growth forms under the influence of fire set to the control and burnt groups

Considering the growth forms of the habitat and villages around it as well as the significance of animal husbandry to the inhabitants of villagers and nomads, the composition and amount of forage is of great importance. Related statistics indicate that the concentrations of class I species such as Astragalus remotijogus and Onobrychis melanotricha are significantly different in the two areas ($P<0.005$). Moreover, fire has reduced the concentration of these species as well (Table 3). The aforementioned finding complies with the findings reported by 37, 12, 30, 1, 20 and 17. In addition, the species from this palatability class included the aforementioned two species as well as the following annual species: M.polymorha , Medicago radiata, Coronilla scorpoides, Astragalus hamosus, Lense orvensis, Lotus gebelia, Trigonella spruneriana, M.orbicularis, M.rigidula. The average annual production of these species was (14.9 gr/m2) was reduced to 8.8 gr/m2 in the control area. The amount of canopies was also decreased from 12.3 to 12.2% in burnt area. However, no significant statistical difference was observed between these groups ($P<0.05$ and $P<0.01$). Apparently, the dominance of annual plants over this palatability class has been the cause of lack of considerable change of these factors. Invasive plants are severely changed, although the average concentrations of perennial plants of this class do not significantly vary for these two areas. However, assuming statistical weights for annual plants in calculations, the statistical difference is increase drastically due to the frequency and dominance of these plants. According to the statistics, the average production factors and canopies of the control groups has increased from 114 gr/m2 to 30.3 gr/m2. The canopies of the burnt area has also decreased from 52% to 35.5% ($P<0.01$, Table 3). Similar results were reported by 8, 38, 28 and 5.

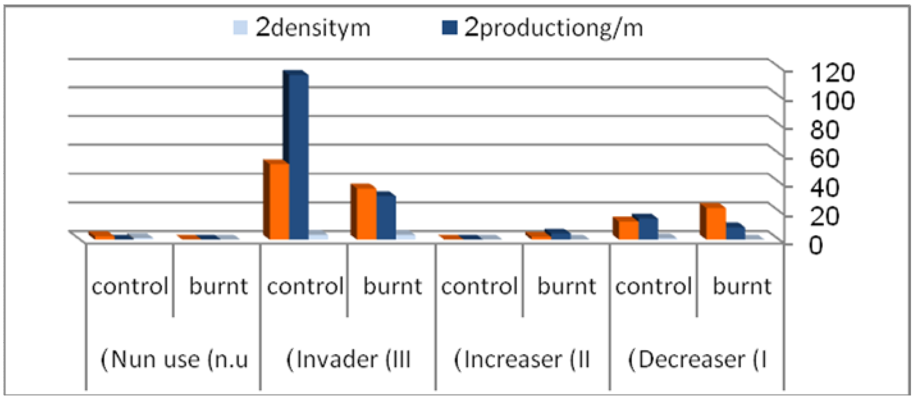

Figure (6): The diagram of variations of different classes of palatability under the influence of fire in the control and burnt areas

According to the statistics, conflagration leads to a drastic decrease in the factors of producing canopy, litter, and organic matter that are necessary for growth and protection of soil. As a result of this decrease soil protective layers are also deteriorated. On the other hand, the negative characteristics such as bare soil and rock and pebbles amount are increased in the burnt area compared to the control area. Accordingly, this habitat is experiencing a crisis of vegetation and soil protection. Moreover, a statistical inspection of the growth forms and palatability classes reveals that the structure of vegetation and forage produced in the habitat suffer from deficiency. Consequently, this habitat is greatly affected by adverse effects of conflagration. Therefore, setting fire to habitats with dominant annual plants is not recommended. Statistical analyses also suggest that the negative effect of conflagration on such habitats is more than positive effects and iteration of conflagration with short intervals can lead to deterioration of vegetation and enhancement of erosional facies. Hence, although the reduction in production, canopies, litters and concentration of several-year-old plants is not significant, it partially happens in the event of one blaze and partially affects the vegetation. A repeated increase in the amount of bare soil, rocks and pebbles on the soil surface leads to an increase in runoffs and a decrease in penetrability and fertility of soil as well as multiple stages of erosion and soil deficiency.

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REFERENCES

1. Adler P, Raff D, Lauenroth W. 2001. The effect of grazing on the spatial heterogeneity of vegetation. Oecologia 128: 465–479.
2. Axelrod, D.I.1985. Rise of the grassland Biom, central North America. Bot . Rev.51: 163-2020- colons, S.L., and Wallace, 1990. fine in North American tall grass prairies Oklahoma press, Norman
3. Badia D, Marti c(2003) Effects of simulated fire on organic matter and selected micro biological properties of two contrasting soils. Arid Lard Res. And Manage. 17: 55-70.
4. Bond, W.J. and van Wilgen. B.W., 1996. Fire and plants. Chapman and Hall, London. Pp. 1-263.
5. Boyd, C. S., and K. W. Davies. 2010. Shrub microsite influences post-fire perennial grass establishment. Rangeland Ecology & Management 63:248-252.
6. Bradstock, R., Williams, J. And Gill, M., 2002. Flammable Australia- fire regimes and biodiversity of a continent. Cambridge University Press. 462 pp.
7. Cano, E., Estelrich, H.D. & Holgado, H. (1985). Acci´on del fuego en los estratos graminosos y arbustivos de un bosque de cald´en. Revista de la Facultad de Agronomıa, U.N. La Pampa, 1: 81]95.
8. Chambers, J. C., B. A. Roundy, R. R. Blank, S. E. Meyer, and A. Whittaker. 2007. What makes Great Basin sagebrush ecosystems invasible by Bromus tectorum? Ecological Monographs 77:117-145.
9. Corbin, J. D., and C. M. D'Antonio. 2004. Competition between native perennial and exotic annual grasses: implications for an historical invasion. Ecology 85:1273-1283.
10. Crowder, L.V., 1985. Pasture . Academic press. Incl. pp 104-123.
11. Dale G. Brockway, R.G. Gatewood & R.B. Paris. 2002. Restoring fire as an ecological process in short grass prairie ecosystems: initial effects of prescribed burning during the dormant and growing seasons. J. Environmental Management, 65:135-152.
12. Davies KW, Bates JD, Svejcar TJ, Boyd CS. 2010. Effects of long-term livestock grazing on fuel characteristics in rangelands: an example from the sagebrush steppe. Rangeland Ecology and Management 63: 662–669.

13. Davies, K. W., R. L. Sheley, and J. D. Bates. 2008. Does fall prescribed burning Artemisia tridentata steppe promote invasion or resistance to invasion after a recovery period? Journal of Arid Environments 72:1073-1082.
14. Elwell, H.A., Stocking , M.A., 1976. Vegetal cover to estimate soil erosion hazard in Rhode sia. Gooderma 15(1), 61-70.
15. Emmerich W.E. and R.K.Heitschmidt. (2002). Drought and grazing : II effects on run off and water quality . Journal of Range management 55: 229-234.
16. Engle, D.M., R.L. Mitchell & R.L. Stevens, 1998. Late growing season fire effect in mid successional tall-grass prairies, Journal of Range Management, 51(1): 115-121.
17. Eva K. Strand and Karen L. Launchbaugh.2013. Livestock Grazing Effects on Fuel Loads for Wildland Fire in Sagebrush Dominated Ecosystems. Great Basin Fire Science Delivery Report– April 2013.Idaho University.21p.1-16.
18. Ford, P.L. & McPherson, G.R. (1996). Ecology of fire in shortgrass prairie of the southern Great Plains. In: Finch, D.M. (Ed.), Ecosystem Disturbance and Wildlife Conservation in Western Grasslands. A symposium proceedings, pp. 20]39. Frank, E.O. & Llorens, E.M. (1990). Evaluaci´on de la din´amica de los pastizales en la regi´on del caldenal. Revista de la Facultad de Agronom´ıa, U.N. La Pampa, 5: 105]110.
19. Fotohi, A. A. 2003. Instruction of SPSS 10. Assal pub. 4th Edition. 448(116-127) 11p. (in Persian).
20. France KA, Ganskopp DC, Boyd CS. 2008. Interspace/Undercanopy Foraging Patterns of Beef Cattle in Sagebrush Habitats. Rangeland Ecology & Management 61: 389–393.
21. Fuhlendorf,S.D. and Engle, D.M., 2004, application of the fire-grazing interaction to restore a shifting mosaic on tall grass praire. Jornal of Applied Ecology 41:604-614.
22. Gill, , A. M., 1975. Fire and the Australian flora : Areview. Australian forestry 38: 4-25.
23. Goldhammer, J. And de Ronde C., 2004. Wildland fire management hand book for sub – Sahara Africa. ISBN-919833-65-X. P.285-323.
24. Govender, N., Trollope. W.SW. and van Wilgen. B.W., 2006. The Effect of fire season, fire intensities in savanna vegetation in South Africa. Journal of Applied Ecology 43, 748-758.
25. Humphery, R.R., 1962. Range ecology. The Ronald press company. New York. 234pp.
26. Humphrey, L. D., and E. W. Schupp. 2004. Competition as a barrier to establishment of a native perennial grass (Elymus elymoides) in alien annual grass (Bromus tectorum) communities. Journal of Arid Environments 58:405-422.
27. Javadi, S, A., Mamoon, Z., (2011), Effect fire on the soil and plants in Rangeland ecosystems, Behbahan Pir Golesorkh, Natural Restoration source, Range scientific.1:45-54. (in Persian).
28. Johnson, A.H. and R.M. Strang (1983). Burning in a Bunchgrass/ Sagebrush community: The Southern interior of B. C and Northwestern U. S. compared. Journal Range Manage., 36: 616-618.
29. Kenneth E.spaeth. Frederick B.Pierson. Peter R. Robichaud. Corey A.Moffet (2004) HydroloErosion,Plant and Soil Relationship after Rangeland wildfire.
30. Leonard S, Kirkpatrick J, Marsden-Smedley J. 2010. Variation in the effects of vertebrate grazing on fire potential between grassland structural types. Journal of Applied Ecology 47: 876–883.
31. Mapiye, C., Mugabe, p. H. and Munthali, D., 2006. The potential of burning and grazing intensity management for rangeland improvement. Southern Africa Jornal of Science Education and Technology 1:103-110.
32. Martinez Carretero, E. (1987). El incendio de la vegetaci´on en la Precordillera mendocina V. P´erdida de la calidad nutritiva del sistema natural. Parodiana, 5: 121]134.
33. Nourian, M., Afshani, A., And, Hussayni, R, Z., (2008), Phrase on SPSS 14, Beh avaran – Yeganeh pub, 6p (134-140)]330.
34. Pandey, A.N., 1988. Short- term study of recovery of Tropical Grassland following seasonal burning . Tropical Ecology 29:159-170.
35. Ravi, S.,P.D odorico, B.Herbert, T.M, 20 Zobeck, and T.M.Over. 2006. Enhance ment of wind erosion by fire – induced water repellency. Water Resources Research 42:w 11422.
36. Richard Teague. Sara E. Duke, J.Alan Waggoner , Steve L.Dowhower and Shannon A.Gerrad (2008) Rangeland regetation and Soil response to summer Patch fires under Continous Grazing . Arid Land Research and Research and Management . 22: 228-241.
37. Rimer, R. L., and R. D. Evans. 2006. Invasion of downy brome (Bromus tectorum L.) causes rapid changes in the nitrogen cycle. American Midland Naturalist 156:252-258.
38. Seabloom, E. W., W. S. Harpole, O. J. Reichman, and D. Tilman. 2003. Invasion, competitive dominance, and resource use by exotic and native California grassland species. Proceedings of the National Academy of Sciences of the United States of America 100:13384-13389.
39. Senthikumar. K., Manian, S., Udaiyan, K. And paulsamy, S: 1998. Elevated biomass production in burned natural grasslands in Southern India . Tropical Grasslands 32: 50-63.
40. Snyman , H.A., (2004). Short- term response in productirity following on unplanned fire in a semi- arid rangeland of south Africa. J.Of Arid Envirsnment . 56: 465- 485.
41. Tahmasebi, A., and Fatahi, B., 2010, Effect fire on the changes of plant cover in Central Zagross mountain rangelands, (Case of study: Hamedan Province). Rangeland vol. 4. No. 2, 2010. Pp. 228-239. (in Persian).
42. Tainton N.M. and Mentis, M.T., 1984. Fire in grasslands. In: Booysen and Tainton, N.M(eds). Ecological effects of fire in South African ecosystems. Springger- Verlag, Berlin. Germany. Pp. 115-147.
43. Town, G. and Ohlenbush, P.D., 1992, Rangeland Brush Management, Kansas State University Agricultural Experiment Station and Cooperative Extension Service

44. Trollope, W.S.W., 1999. Veld burning. In: N.M., Tainton (ed) Veld and pasture management in South Africa. Shutter and Shooter, Pieternmaritzburg. Pp. 217-243.
45. Valizadeh, M. & M. Moghadam, 1997. Experimental design in agriculture. Parivar Pub., 395p. In Iran.
46. Van Wilgen. B.W.Govender. N., Biggs. H.C., Ntsala. D. And funda X.N., 2004. Response of savanna fire regimes to changing fire management policies in a large African national park. Conservation Biology 18: 1533-540.
47. Vermeire, L.T., R.B.Mitchell, s.d.Fuhlen drof and R.L.Gillen (2004). Patch burning effect on grazing distribution. Journal of Range management 46: 2-13.
48. Yin, H.W., Kong, F.H. and Li, X.Z., 2004. RS and GIS-based forest fire risk zone mapping in da hinggan mountains. Chinese Geographical Science, 14 (3): 251-257.

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