International journal of Advanced Biological and Biomedical Research (IJABBR)
Available online at http://www.ijabbr.com
Volume 1, Issue 1 (March, 2013), PP 61-70

Modeling of Suitability Iranian Oak site for establish of coppice regeneration in Zagros forest

Yousef Askari [*1], Mohammad kazem Parsapour [2] and Zahra hosseni [3]

[1] Ph.D student of forestry, University of Shahrekord, Shahrekord, Iran
[2] M.Sc. Graduate of forestry, University of Shahrekord, Shahrekord, Iran
[3] M.Sc. Graduate of forestry, University of Shahrekord, Shahrekord, Iran

ABSTRACT

To modeling of Suitability Iranian Oak site to establish coppice regenerations, chahartagh forest reserve, Ardal region, chaharmehal and Bakhtiari Province, southern Zagros forest, and southwest Iranian state was selected. To modeling Suitability Iranian Oak used the physiographic element, soil depth, climatology and distance from village selected. To this study used the raster formats by pixel size 20 meter and data convert to this size and physiographic and other parameter extracted. The element have negative impact on the Oak condition was negative score. By used the table of score and range of score detected the site condition. Site condition divided the high un-appropriate, un-appropriate, average, appropriate and high appropriate. Results showed that the 40 percent of study area are appropriate and high appropriate condition for established the seed regeneration. Overall Results showed that the approximately of 40 percent of study area have a suitable condition for regeneration. Prevention of livestock grazing and irregular tree cutting in the degraded forest stands can be suggested as a suitable approach for natural restoration and increasing plant diversity and regenerations.

Key words: Iran, Chaharmehal and Bakhtiari Province, Zagros forest, Iranian oak site,

INTRODUCTION

Forests cover about 12 million ha in Iran (Forest and Rangeland Organization, 2002 and Haidari *et al*, 2012). The Zagros forests cover a vast area of the Zagros mountain ranges stretching from Piranshahr (Western Azerbaijan Province) in the northwest of the Iran to the vicinity of Firooz-Abad (Fars Province), having an average length and width of 1300 km and 200 km, respectively (Haidari *et al*, 2013). These forests cover approximately an area of 5 million ha, and because of dominancy of species of oak genus, these forests are called as western oak forests (Bazyar *et al*, 2013 and Marvi-Mohajer, 2005). Zagros is typically characterized by a semi-humid climate with extremely cold winters and annual precipitation exceeding 800 mm .The main species in this region are *Quercus* spp. (oaks), *Pistacia mutica* (wild pistachio), *Crategus* spp. and *Pyrus* spp (Ghazanfari *et al*, 2004 and Haidari *et al*, 2012b). Zagros forest have a maximum of effect on the supply of water, protection of soils, balance of water and climatology, balance of economical and sociable condition in the country (Sagheb-Talebi *et al*, 2005). The Oak family the Quercus *brantii (Oak forest) is an* exclusive the *chaharmehal and Bakhtiari Province*. This species have a high evaluation for rise the ecological potential of Zagros forest, supply 40% of country waters, rise the unisexual regeneration and sustainable regenerations, utilization of non-wood forest productions (for the

Corresponding Author : Yousef Askari, E-mail: Yousef.askari@gmail.com

fruits, drug, used the tree foliage, sustainable wild life, use the Wood and firewood to fuel using (Fattahi, 1993). the importance of extracted information from land use planning, including social – economic factors, wildlife density of canopy and finally land use planning itself along with other obtained information from it, was clearly determined in procedure of selecting species for species plantation trials (Najafifar, 2006). The researcher studied and Proposal of a forest physical model for ecological capability evaluation in Zagros vegetation zone, In order to ecological evaluation in the study area, some factors including altitude, aspect, slope, climate, land form and soil depth were applied. The results obtained from this model showed that there are 425 different ecological situations in 7436 ecological final unit within the study site. Coefficient of determination (R2=0.56) between potency gradations of ecological potential and mean height of trees in 64 field plots (0.15 ha) showed that this model is fairly suitable efficient for ecological potency evaluation in Zagros forests (Najafifar, 2010). The researcher study of effective factors on distribution of coppice and high forests in traditional forestry of central Zagros The results showed that most of coppice stand occurs in gentle slopes, low elevations, north and eastern aspects and near to population centers. Meanwhile, high stand occurs in high elevations, steep slopes, distant from population centers and west and southern aspects. The road had not any role in distribution of stands. In understory farmlands disregard to other factors only high stand may occur (Namiranian et al, 2010). The researcher studied of Ecological Capability Evaluation of Babolrood Watershed using Geographic Information System, and results showed that 4072.5 hectare for forestry has one class capability and respectively 25667.2, 8801.5, 1482.9 and 103.1 hectare have the two, three, four and five classes' capability. 11597 hectare of study area has got no capability for forestry (Krami et al, 2012). The aim of this study is modeling of Suitability of establish coppice regeneration of Iranian Oak and detection of suitable area to establish of regeneration in the Chartaghe forest, Ardal region, chaharmehal and Bakhtiari Province in southern Zagros forest.

MATERIALS AND METHODS

This research was investigated in the chahartagh forest reserve, Ardal region, chaharmehal and Bakhtiari Province, southern Zagros forest, and southwest Iranian state (Figure 1). Chahartagh Forest reserve located 100 kilometer of southeast Shahrekord city and 40 kilometer of south Ardal region (Jahanbazi Gojani, 1998).

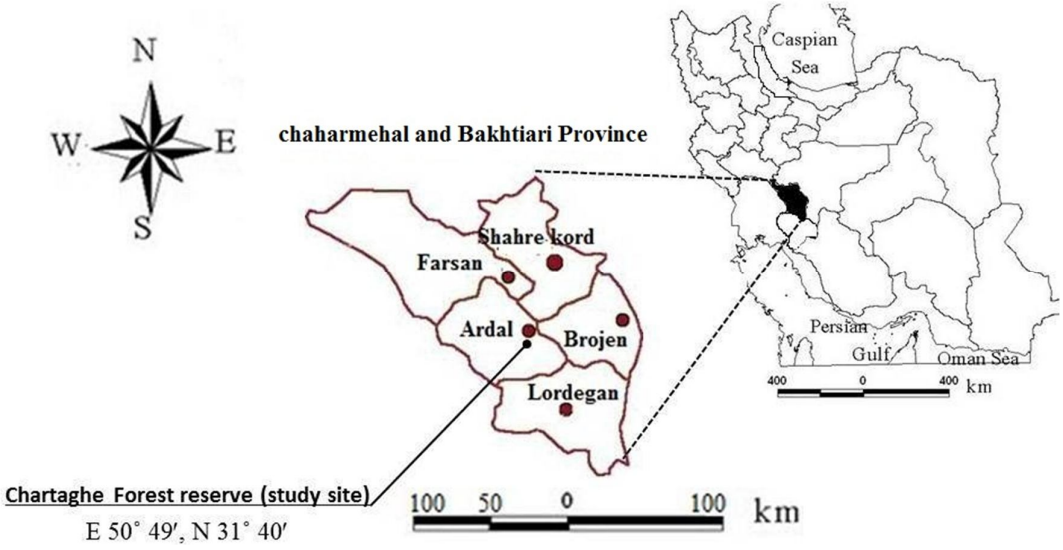

Figure 1. Study site location in the chaharmehal and Bakhtiari Province, Zagros region, and Western Iranian state of Iran.

Selection of environmental variables

The plants was stable (location conditions) in the site and not able to change location. So ecological conditions of site have a most effect on the survival of plant species. In the plant species the tree has a more age and more dependent the site conditions, because establishment of tree need the desirable site conditions and establishment other species in the nearer the seed tree. Site conditions are dependent the seed tree to sexual or unisexual regeneration (Spurr, 1964). Environmental variables are include the forest environment (climatic and soil factors, nutrient cycle, soil/plant water cycle etc.) and forest community (competition, succession, disturbance effects, forest description and measurement). To study of major Environmental element on the establish coppice regenerations of Iranian Oak used the literature review in the Zagros forest and other forest in the Iran and other country. Environmental element include the:

1- Physiographic is element and Geography

The researcher focused on the effect of physiographic element and geography on the establishment of plant species (Carmean, 1977; Burger, 1976). The relationship and regression between the physiographic element and plant community increment is the important (Carmean, 1977). This research studied the effect of physiographic condition on the plant parameters include: (Haidari *et al*, 2009; Mirzaei *et al*, 2007; Parma and Shataei Joybari, 2009; Khanhasani *et al*, 2004; Jazirehei and Ebrahimi Rastaghi, 2003; Alijanpour *et al*, 2009; Hosseini *et al*, 2005; Talebi *et al*, 2004; Bordbar *et al*, 2007; Mirzaei *et al*, 2005; Mahdavi *et al*, 2009; Namiranian *et al*, 2008).

1-1: slope

A slope condition has a negative and positive effect on the presence and absence of species (Indirectly effects). By increase the slope (%), increase the soil erosion, high drainage, dry soils (more in the southern aspects), non-establishment of seeds and negative effect on the presence of species (Mirzaei *et al*, 2007).

1-2: Aspect directions

The Oaks species higher density in the northern and western aspect (because has a higher soil moisture), but this species observe in the total of aspects directions (Jazirehei and Ebrahimi Rastaghi, 2003). The researcher showed that the maximum of seeding regeneration observe in the northern aspects, but maximum of coppice regeneration observe in the southern aspect in the Arghavan protected area in the Ilam forest (Mirzaei *et al*, 2005).

1-3: Altitude

Jazirehei and Ebrahimi Rastaghi, 2003 showed that the suitable altitude range for the establishment of Iranian Oaks is 1000 to 2000 meter. But chaharmehal and Bakhtiari Province

located in the high altitude (more 2000 meter altitude) and more of Oak established in the 1000 to 2400 m altitude (Talebi *et al*, 2005).

2. Soil

Several study accrued on the effect of soil conditions on the trees increments (Salehi *et al*, 2009; Bordbar *et al*, 2008). In the most studied the Iranian Oak forest located in the shallow or medium depth soil (Jazirehei and Ebrahimi Rastaghi, 2003). Establishments of seeding regeneration and seed needs the deepen soils in compere of coppice regenerations (Mirzaei *et al*, 2005).

3. Climatology characters and rate of available moisture

The study of regeneration in the arid and semi-arid area showed that the quantity of available moisture in soil was the major element for establishment of Oak regenerations (Mahoney and Rood, 1998; Shafroth *et al*, 2000; Taylor, 1999). This element influenced indirect by the aspects directs, and in northern aspect the quantity of available moisture in soil increased and minimum of soil moisture observed in the southern aspects (Talebi *et al*, 2005).

4. Human element (villages, roads and mines)

The researcher study effect of on the seeding and coppice stands in the Zagros forests and results showed that the seeding stands observed in the farther (more distance from population) distance from village, coppice forest observed in the nearest the village (Namiranian *et al*, 2007).

5. Effect of nursing species and distance from mother tree

The spatial pattern of Iranian Oak forest was clumped distribution (Basiri *et al*, 2005; Erfanifard *et al*, 2009). The establishments of seeding and coppice regeneration need to presence the mother trees. So that distance from mother trees has an effect on the regenerations. In the between of species are compact relationship, Competition and Coexistence. This element has effect on the presence and absence of species.

Analysis

In the first levels for classification of the physiographic element in the study area used the raster formats by pixel size 20 meter and data convert to this size. In the next stage in each factor used the classes in the table 1, and reclassify of pixels. To supply the soil maps used the basic image satellite and detections of two characters classes. To study effect of altitude in this model used the DEM (Digital Elevation Model) in study area in 20 meter pixel size, and altitude divided the three classes. By used the area function in the DEM maps extracted the aspect and slope maps, and slope maps divided in the four classes. Climatology maps extracted in the basic maps and divided in the three classes. Distance from village measured by used the Euclidean distance functions, And in the mountain area (hard access area) two kilometers distance was assumed the threshold distance.

Table 1: scores matrix factor of different element of desirability Iranian oak site for establish of coppice regeneration

		Coppice regeneration
Slope	0 - 20	+8
	20 - 40	+8
	40 – 60	+4
	More 60	+4
Aspect	N	+4
	S	+8
	E	+2
	W	+2
	NW	+2
	NE	+2
	SW	+8
	SE	+2
Altitude	1000 – 2000	+8
	2000 - 2400	+4
	More the 2400 m	-8
Soils depth	Less to average depth	+4
	Salient rocks	-4
climatology	cold	+1
	Semi-humid	+1
	other	-1
Distance from village	Less the 2000 meter	+1
	more the 2000 meter	+2

*In this models major element of Iranian Oak growth matrix by order of priority include: physiographic parameter, soil depth, distance from village and climatological parameters.

After the reclassify of total elements, scores matrix table for analysis of major element factor on the Iranian Oak forest established. Table of scores (table 1) established in the base of literature review. The scores of physiographic parameter include: aspect, slope and altitude for the maximum of importance considered the eight scores, because physiographic parameter have a more effect in compere of soils and distance from village. The score of soils parameter was four, the score of climatology was one and the score of two. The elements have a negative effect on the Iranian Oak growth have a negative score. The reclassification of Iranian Oak site by used the five qualities classes in table 1. After the supply of the vector layer of the five qualities classes, every layer overlay in the GIS (Geographic Information System) and calculated the scores by used the table 2.

Table 2: the range score of the Iranian Oak site conditions

	Iranian Oak site condition code for establish of coppice regeneration				
desirable site conditions degree	5	4	3	2	1
	excellent	good	average	weak	Without desirable condition
Total of score	23.25-31	15.5-23.5	7.75-15.5	0-7.75	0

RESULTS

Study of site condition and detections the area of site have a un- appropriate condition are the important key in the forest management, because the sections of site have coppice regeneration problems detected and planning for protection and conservations of this area.

Table 3: results of Iranian Oak site condition for establish of coppice regeneration in the study area (area of each class's code)

	classes	code	Area (hectare)	percentage
Coppice regeneration	high un-appropriate	1	264	28
	un-appropriate	2	256	27
	average	3	54	4
	appropriate	4	196	21
	high appropriate	5	184	19

The results of coppice regenerations showed that the 437 hectare of the study area (41 percentage of study area) has an appropriate condition (average, appropriate and high appropriate).

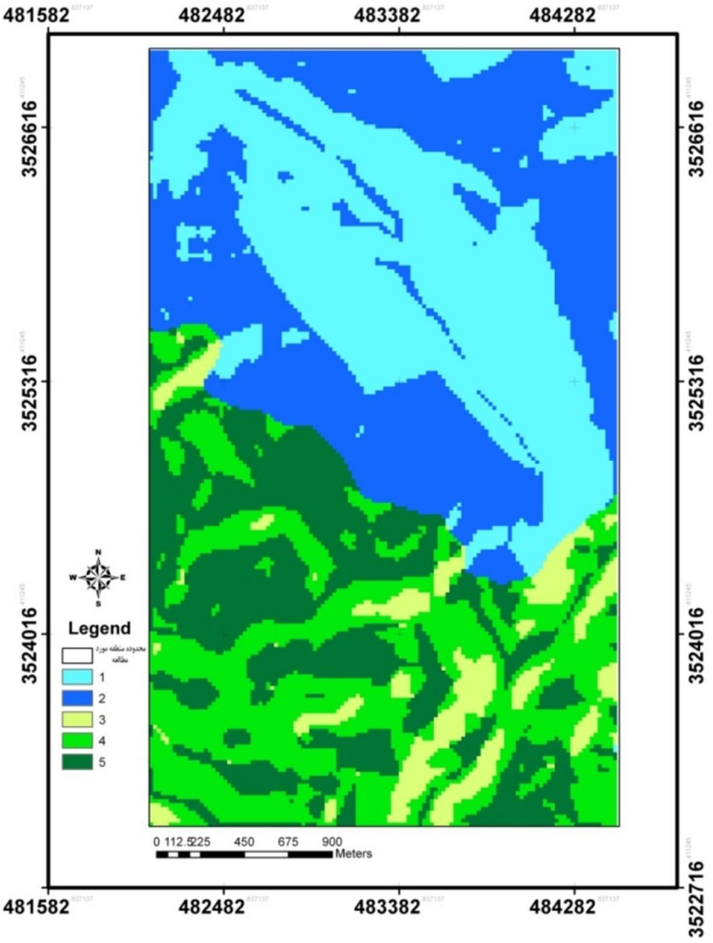

Figure 2: the maps of suitable area for coppice regeneration

Results figure 2 showed the site condition classes for coppice regeneration are was divided the five classes include: High un-appropriate (264 hectare), un-appropriate (256 hectare), average (54 hectare), appropriate (196 hectare) and high appropriate (184 hectare). Forests area of Iran in comparison with the world is very low and this low area is in demolition threat always. Hence, the remainder of these forests should be managed based on ecological capability evaluation (Krami *et al*, 2012). Results of this researches are detected the suitable area for coppice regeneration in the southern zagros forest. In this research the site of Iranian Oak in Chartaghe reserve forest in Charmaehal and Bakhtyari classified by used the five element, and each element divided the five degree of desirable condition include High un-appropriate, un-appropriate, average, appropriate and high appropriate. Results showed that the 437 hectare of the study area (41 percentage of study area) has an appropriate condition for coppice regeneration (table 3 and figure 2), and this results emphasis the un- appropriate conditions of major element of establishment the coppice regeneration in the study areas. The main limiting factors of establishment the regeneration are: higher elevations, lowest of soil depth, salient rocks and nearest the village. The population center (village) effected on the

forest by the overgrazing and eats the seedling, collect of tree seed, grazing in the cold season and compact of soil by livestock pressure. Unfortunately the totals of parameter lead to reduce the Iranian Oak regeneration (Fatahii, 1994). So that the coppice regeneration has a not appropriate conditions and this problem showed that the major problem of this forest was regenerations and this results emphasis the Fattahii (1994), Mirzaei *et al* (2005) and Bordbar *et al* (2008). Overall results showed that the coppice regeneration site condition in the Zagros forest not the appropriate conditions and the main limiting factors of establishment the regeneration are: higher elevations, lowest of soil depth, salient rocks and nearest the village. The physiographic element, soil depth and population center (village) was the major element on Modeling of Suitability Iranian Oak habitat, and this researcher reached this results include: Mahdavi *et al*, 2009; Mirzaei *et al*, 2005; Hosseini *et al*, 2005; Alijanpour *et al*, 2009; Parma and Shataei Joybari, 2009 and Mirzaei *et al*, 2007, Talebi *et al*, 2005, Mirzaei *et al*, 2009, Jazirehei and Ebrahimi Rastaghi, 2003, Najafifar, 2011, Namiranian *et al*, 2008, Mahoney and Rood, 1998; Shafroth *et al*, 2000; Taylor, 1999, Namiranian *et al*, 2007, Basiri *et al*, 2005; Erfanifard *et al*, 2009. Overall results showed the soil depth is a major element on the establishment of coppice regeneration and increase the biodiversity. Therefore, prevention of livestock grazing and irregular tree cutting in the degraded forest stands can be suggested as a suitable approach for natural restoration and increasing plant diversity and regenerations.

CONCLUSION

These Zagros forests cover approximately an area of 5 million ha, and because of dominancy of species of oak genus, these forests are called as western oak forests. Results showed that the approximately of 41 percent of study area have a suitable condition for coppice regeneration. Overall results showed that the physiographic element, soil depth and population center (village) was the major element on Modeling of establishment of coppice regeneration Iranian Oak. Prevention of livestock grazing and irregular tree cutting in the degraded forest stands can be suggested as a suitable approach for natural restoration and increasing plant diversity and regenerations.

REFERENCES

Forest and Rangeland Organization of Iran, 2002. Strategies for sustainable forest management in Zagros forests, Technical Report, Forest and Rangeland Organization, Teheran, Iran, 70 p.

Ghazanfari H, Namiranian M, Sobhani H, MarviMohajer M.R, 2004. Traditional forest management and its application to encourage public participation for sustainable forest management in the northern Zagros mountain of Kurdistan province, Iran, Scandinavian Journal of forest science, 19, 65-71.

Haidari M, Shabanian N, Haidari R.H, Bazyar M, 2012. Structural diversity of oak forests in Kurdistan Province (Case study: Oak forest), IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS), 4(3): 37-43.

Haidari M, Jalilvand H, Haidari R.H, Shabanian N, 2012. Study of Plant Biodiversity in Grazed and Non-grazed Areas in the Iran-o-Turanian Ecological Zones (Case Study: Yazd Province, IRAN), Annals of Biological Research, 3 (11):5019-5027.

Hosseini S.A. O, Haidari M, Shabanian N, Haidari R.H, Fathizadeh O, 2012. The impact of single selection method logging on the tree and shrub diversity in the Hyrcanian forests, European Journal of Experimental Biology, 2 (6):2229-2237.

Haidari M, Namiranian M, Gahramani L, Zobeiri M, Shabanian N, 2013. Study of vertical and horizontal forest structure in Northern Zagros Forest (Case study: West of Iran, Oak forest), European Journal of Experimental Biology, 3(1):268-278.

Jazirehi MH, Rostaghi EM, 2003. Silviculture in Zagros. University of Tehran Press, Tehran, 520p.

Magurran A.E, 1988.Ecological diversity and measurement. Princeton University Press, Princeton, 354p.

Mirdavoodi HR, Zahedi Pour H, 2006. Determination of suitable species diversity model for Meghan playa plant association and effect of some ecological factors on diversity change. Pajuhesh & Sazandegi j, 68, 56-65.

Aubert M, Alard D, Bureau F, 2004. . Diversity of plant Assemblages in managed temperate forests: a case study in Normandy (France), Forest Ecol Manag, 175, 321-337.

Baev PV, Penev LD, BIODIV. Program for calculating biological diversity parameters, similarity, niche overlap.

Ardakani MR. 2004, Ecology. Tehran University Press, 340.

Bazyar M, Haidari M, Shabanian N, Haidari R.H, 2013. Impact of physiographical factors on the plant species diversity in the Northern Zagros Forest (Case study, Kurdistan Province, Marivan region), Annals of Biological Research, 4 (1):317-324.

Fattahi M, 1994. Study on Zagros oak forests and the most important their destruction causes, Institute of Forests and Rangelands Research press, Sanandaj, Iran.

Najafifar A, 2006. Selection of forest species based on ecological capability of afforestation units in Zagross region: Case study of watershed of Sarab Darehshahr in Ilam province, Pajouhesh & Sazandegi Journal in the natural resource, 75: 28-36.

Najafifar A, 2010. Proposal of a forest physical model for ecological capability evaluation in Zagros vegetation zone (Case study: Masby region, Abadan city, Ilam province), Iranian Journal of Forest and Poplar Research, 18(3): 404-416.

Najafifar A, 2011. Sexual regeneration frequency of forest species in Zagros area in relation to different ecological factors in Ilam province, Iranian Journal of Forest and Poplar Research, 19(2), 278-290.

Najafifar A, 2011, the role of land use planning in optimal management of Zagros forests (Case study: Sarab Darrehshahr catchment, Ilam province), Iranian Journal of Forest and Poplar Research, 19(4), 509-522.

Namiranian M, Maleknia R. Feghhi J, 2010. Effective factors on distribution of coppice and high forests in traditional forestry of central Zagros (Case study: Customary properties of Sarableh and Cheshmeh Khazaneh), Journal of Forest and Wood Products (JFWP), Iranian Journal of Natural Resources, 62(4), 429-441.

Karami O, Hosseini Nasr S.M, Jalilvand H, Miryaghubzadeh M, 2001, Ecological Capability Evaluation of Babolrood Watershed using Geographic Information System, J. of Wood & Forest Science and Technology, 19(1), 1-22.

Bordbar K, Sagheb-Talebi Kh, Hamzehpour M, Joukar L, Pakparvar M, Impact of environmental factors on distribution and some quantitative characteristics of Manna Oak (Quercus brantii Lindl.) in Fars province, Iranian Journal of Forest and Poplar Research, 18(3): 390-404.

Basiri R, Sohrabi H, Mozayen M, 2006. A Statistical Analysis of the Spatial Pattern of Trees Species in Ghamisheleh Marivan Region, Iran, Journal of the Iranian Natural Res, 59(2): 579 - 588 .

Jahanbazi gojani H, Ahmadi Karori S, Talebi M, 1998. Researches planning of natural resource, Iran, 87p.

Hosseini A, 2009. Dynamic of Oak seed regeneration in the zagros forest, Journal of Iranian natural ecosystems, 1(1):1-12.

Parma R, Shataee Jouybari Sh, 2010. Impact of physiographic and human factors on crown cover and diversity of woody species in the Zagros forests (Case study: Ghalajeh forests, Kermanshah province), Iranian Journal of Forest and Poplar Research, 18(4): 537-555.

Hosseini A, Moayeri M.H, Haidari H, 2008. Effect of site elevation on natural regeneration and other characters of oak in the Hyanan forest, J.Agric.Sci.Natur.Resour, 15(1):1-11.

Mahdavi A, Heydari M, Eshaghi Rad J, 2010. Investigation on biodiversity and richness of plant species in relation to physiography and physic-chemical properties of soil in Kabirkoh protected area, Iranian Journal of Forest and Poplar Research, 18(3): 425-436

Khan Hasani M, Jalili A, Khodakarami Y, 2004. Study of silviculture characteristic of Kermanshah province, Iranian Journal of Forest and Poplar Research, 13(2): 221-232.

Salehi A, Mohammadi A, Safari A, 2011. Investigation and comparison of physical and chemical soil properties and quantitative characteristics of trees in less-damaged and damaged area of Zagross forests (Case study: Poldokhtar, Lorestan province), Iranian Journal of Forest, 3(1): 80-89.

Talebi M, Sagheb-Talebi Kh, Jahanbazi H, 2004. Site demands and some quantitative and qualitative characteristics of Persian Oak (Quercus brantii Lindl.)In Chaharmahal & Bakhtiari Province (western Iran), Iranian Journal of Forest and Poplar Research, 14(1): 68-81.

Alijanpour A, Banj Shafiei A, Eshaghi Rad J, 2010. Investigation of natural regeneration characteristics in west oak forests within different levels of site factors (case study: Piranshahr region), Iranian Journal of Forest, 2(3): 208-219.

Mosadegh A, 1996, Silviculture, University of Tehran, Iran, 481p.

Mahdavi A, Heydari M, Bastam R, 2010, Vegetation in relation to some edaphic and physiographic characteristics of site (case study: Kabirkuh Ilam), Iranian Journal of Forest and Poplar Research, 17(4): 526-539.

Mirzaei J, Akbarinia M, Hosseni S.M, Kohzadi M,2008. Biodiversity Comparison of Woody and Ground Vegetation Species in Relation to Environmental Factors in Different Aspects of Zagros forest, ENVIRONMENTAL SCIENCES, 5(3) 85 -94

Mirzaei J, Tabari S, 2006. Comparison of natural regenerated woody species in relation to physiographic and soil factors in Zagros forests (Case study: Arghavan reservoir in north of Ilam province), Pajouhesh & Sazandegi, 77: 16-23

Naderi A, Zahrzad P, 2010. Butterfly in the central zagros, the first national conference of forest destruction in the central zagros, Iran.