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Full Length Article

Post-fire Vegetation Trajectory in Semi-arid Rangelands

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ABSTRACT
Identifying the trajectory of post-fire vegetation changes is very important in management and restoration of ecosystems. The present study aimed to assess the vegetation recovery after burning in two vegetation types in Bamonational park in Shiraz province, Iran.This park is an important genetic reserve that several fires were reported in last few years. First two sites were selected with different vegetation types and on each site sampling was done in three locations (Control,One year after fire and Five year after fire). The cover percentage of species was estimated in180 plots of 1m².The result of multivariate analysis showed that in each site there was a significant effect of locations with different history of fire.We found remarkable changes in species composition in the first year but the species composition in area with long history of burning was slightly similar to control area.
Keywords: *Vegetation succession, Restoration, Fire, Bamonational park*

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INTRODUCTION

Fire as an ecological factor could positively or negatively affect the components of ecosystems. Fire induces various effects according to the type of climate that results in omitting inappropriate wood plants, increasing the production palatability, releasing the nutrients of plant and litter fall, providing seedbed and controlling pest and fungal diseases [8]. On the other hand, fire has some downsides such as reducing the vegetation cover and increasing soil erosion [7], increasing soil temperature and making damages in underground organs [3]. If fire occurs with the loss of organic matter, nitrogen and sulfur, it will be the most important factor of rangeland destruction after severe grazing [5]. Rehabilitating the vegetation after fire can be performed under different scenarios so that identifying these pathways are important in the management of post-fire.

Monitoring ecosystems during the given time or studying them with the history of fire events are needed to determine the trajectory of changes in vegetation after fire [2]. A large number of rangelands of Iran are in arid and semiarid regions faced to many natural fires. These fires are natural and without manager's interference, so they can make destructive impacts on related ecosystems. Hence, the present research was conducted in Bamo national park, one of the most valuable genetic reserves. According to the successive fires in Bambo national park, the direction of changes in vegetation was studied in two plant types.

MATERIALS AND METHODS

Site description

Bamo national park is located in northeast of Shiraz city, Fars province, Iran. The records of the meteorological data taken from the meteorological station nearest to the case study, Shiraz Station, indicates that the mean annual precipitation is 392.2 mm (SE: ± 20.4 mm). In addition, the mean annual temperature of case study is 17.9 °C.

Two sites, Palaieshgah and Chah-sorkh, according to the type of vegetation and occurred fires were selected in the present study.Ast.spp + Stipa + Ebenus +Acanthare in Palaieshgah and Ebenus + Ast. spp. + Stipaare in Chah-sorkh. Three treatments (locations) were selected in each site which are a: control (without fire), b: one year after fire (accrued in 2007) and c: five year after fire. 90 plots, 30 plots for each

treatment, were measured to determine the vegetation percent of each treatment. Moreover, multivariate analysis using CANOCO was applied to study the direction of post-fire vegetation changes. In this method, first gradient length was measured by Detrended Correspondence Analysis (DCA) that the length of first and second axis was more than 3. Subsequently, Canonical Correspondence Analysis (CCA) was used as a single-exponential model.

RESULT

Results revealed that three locations statistically had significant effects on all plant species in Chah-sorkh site (P=0.001; F=1.998). Three locations are separately distributed around axis according to the combination of plant species (figure1). The location of one year after fire was different with two other locations in terms of the plant combination. Crepis sancta, Phlomisolivieri, Picrisstrigosa, Festucasp, Hordeumbulbosum ,Roemerialybrida, Dutreyacardui form is were came out at first year after burning that most of them are annual. The same species between control and five year after fire were more than those among other locations. The direction of vegetation changes showed that the combination of post-fire vegetation at first year was completely different, but it gradually reached the vegetation combination of control by time. Moreover, there was statistically recorded a significant effect in CCA for Palaieshgah site (P=0.001; F=2.24). In this site also one year after fire located in positive side of first axis is far from two other locations located in second axis (figure1). There were found few common species between one year after fire and other locations, control and five year after fire.

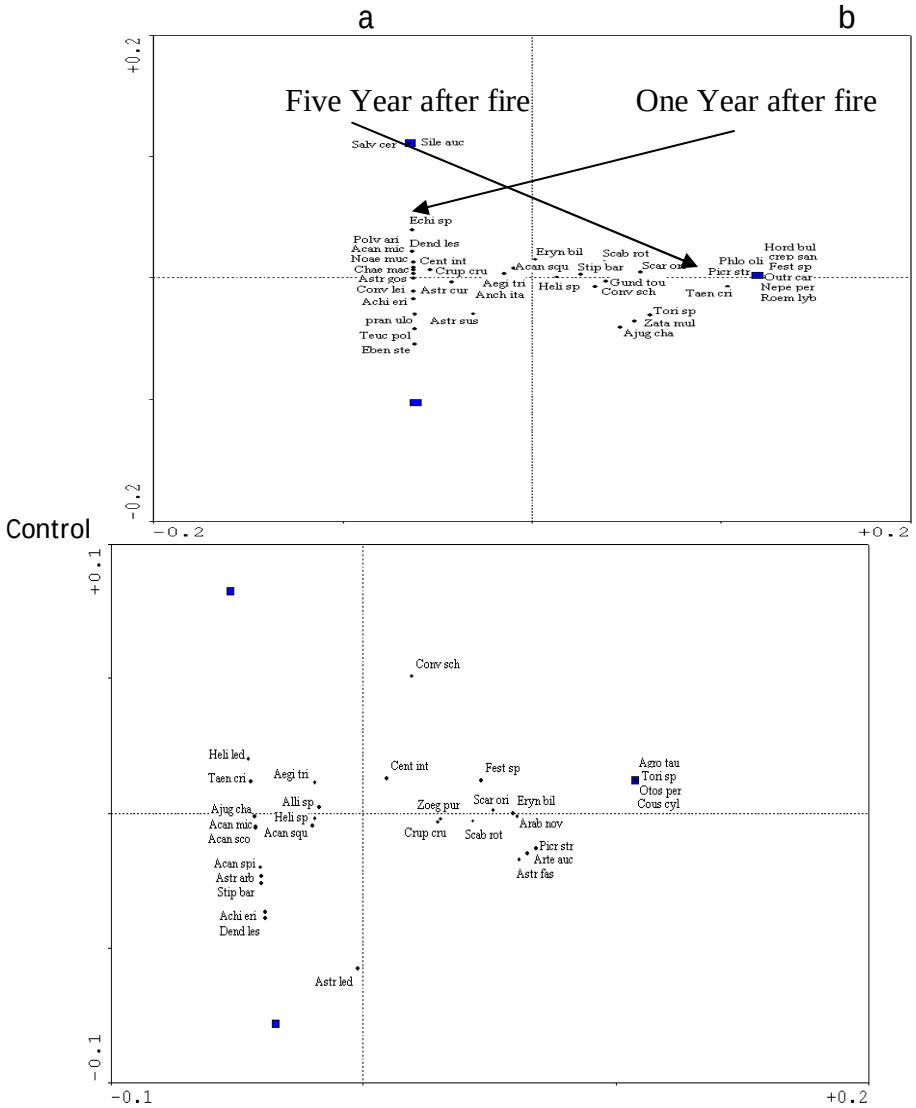

Figure 1- The diagram of CCA in Chah-sorkh (a) and Palaieshgah(b) sites in Bamo national park. Arrows show the direction of vegetation changes

DISCUSSION

Plant composition of two sites and six locations showed that 15 species are common in three locations from all 40 species in Chah-sorkh. There were presented only 12 same species between control and five year after fire and only three species were similar between one year and five year after fire. However, there was no species between control and one year after fire. On the other hand, 12 species were similar in three locations of Palaieshgah site. There were recorded 10 mutual species between control and five year after fire, four species between two burning locations and one species between control and one year after fire. This trend also was found in multivariate analysis and could indicate the trajectory of post-fire vegetation changes. The similarity between control and five year after fire shows that the ecosystem, Bamo national park, gradually reaches its essence background, i.e., ecosystems are flexible and can tolerate adverse condition. If the adverse conditions are not severely powerful, ecosystems can rehabilitee themselves and reach their early position. Protecting operations especially prohibiting the grazing in the park is the main factor that helps the park to get its natural condition. The results are in accordance with that obtained by [4]in mountainous rangelands in Hamadan, west of Iran.[1]indicated that sever grazing resulted in damage of rangeland after fire, but light grazing was suggested to reduce the invasion of strange species and bush. These results are approximately similar to those obtained by the present study.

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