

Investigation of the fire effects on some physico-chemical characteristics of soil (case study: Miankaleh rangeland, Iran)

Mohammadreza Tatian^A, Reza Tamartash^A, Maedeh Yousefian^B, Fatemeh Montazeri^A and Mehdi Jafari^C

^A Agriculture Sciences and Natural Resources, University of Sari, Sari, Iran

^B Range Science Department, Islamic Azad University of Tehran, Tehran, Iran

^C Environmental Science, Natural Resources Organization, Sari, Iran

Contact email: mr_t979@yahoo.com

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Introduction

Fire is one of the ecological factors that can have positive and negative effects on ecosystem processes. Nevertheless, prescribed burning is considered to be an important tool for grassland management, particularly to manipulate the balance between grasses and shrubs (Scheintaub *et al.* 2009). In Iran, for example, Khodaghali *et al.* (2001) in the Samirom rangelands of Isfahan Province suggest that fire reduces the shrubs cover and production and leads to the expansion of grasses. Sharifi and Imani (2006) showed that in the semi-steppe of Khalkhal Province shrub cover decreased in contrast to permanent grasses after fire was applied. However, others report that fire can reduce production and plant diversity due to affects on the range soil properties.

This research investigated the effects of fire on some soil physico-chemical characteristics in the Miankaleh rangeland in northern Iran.

Methods

Study area

Miankaleh is the only survivor of woody land and semi-woody land in the plains of Mazandaran Province, which is located on the southern coast of the Caspian Sea in northern Iran (36°25' to 36°55' N and 53°50' to 54°1'E). The elevation is between 25 to 28 m below sea level and it covers an area of 68800 ha.

Research Method

This study was done in the beginning of vegetative growth period. Soil sampling (0-15 cm) was done using a random-systematic method. Soil physico-chemical characteristics including texture, pH, Ec, organic carbon (OC), bulk density and moisture were measured using standard methods. Data were analyzed by t-Test in SPSS19 software.

Results

Fire had a significant effect on soil moisture ($P \leq 1\%$) and pH, Ec, organic carbon ($P \leq 5\%$). But there was no

Table 1. Mean comparison of factors in the fired soil and unfired soil

Factors	Unfired soil (0-15)	Fired soil (0-15)	Student-t
Moisture (%)	24.2	22.8	0.001**
Organic carbon (%)	1.95	2.19	0.047*
Bulk density (g/cm ³)	2.38	1.46	0.134**
pH	7.4	8.44	0.045*
Ec (dc/m)	453.6	523.6	0.12*

**Significance level 0.01, *Significance level 0.05, ^{ns}Not significant

significant effect on soil bulk density (Table 1).

Fire caused a decrease in soil moisture, and increases in organic carbon, Ec and pH in the study area (Fig. 1 A, B, C, D).

Conclusion

Fire has positive and negative effects on woody lands. In this study it increased soil organic carbon, which is an important factor in nutrient cycling, supporting a previous finding (Carleton and Loftin 2000). These results confirm that the fire can increase salinity and decrease acidity in coastal regions with similar conditions. Moisture reduction is negative effect of fire in the woody and semi woody ecosystems that can be used to manage these ecosystems. Kristofor (2006) showed the effects of burning on soil properties and rangeland management over the long-term.

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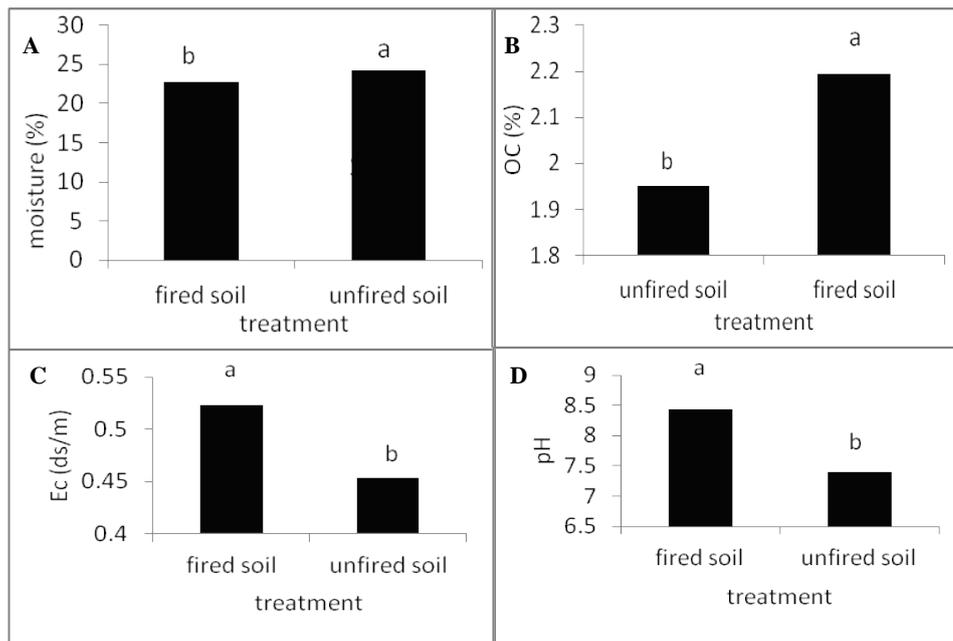


Figure 1. Comparison between unfired and fired soil parameters – (A) soil moisture; (B) organic carbon; (C) Ec; and (D) pH.