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Changes in Hydro-Edaphological Properties Following Fire and Aerator Roller Treatments in Desert Microphyllous and Rosetophyllous Scrubland

ISRAEL CANTU SILVA¹, ROMELIA MEDINA¹, HUMBERTO GONZALEZ RODRIGUEZ¹, MARCO V.
GÓMEZ MEZA², TETSUYA KUBOTA³

¹*Universidad Autónoma de Nuevo León, Fac. of Forest Sciences, Mexico*

²*Universidad Autónoma de Nuevo León, Fac. of Economy, Mexico*

³*Kyushu University, Faculty of Agriculture, Japan*

Abstract

Changes in hydro-edaphological properties in desert microphyllous (MS) and rosetophyllous (RS) scrubland were assessed. Five treatments were established in North Mexico: control (C), aerator roll in 2004 (RA04), 2008 (RA08) and 2011 (RA11) and burned area 2011 (BA11). Variables such as permeability coefficient (CP), bulk density (BD), organic matter (OM), soil reaction (pH), electrical conductivity (EC), available water (AW), soil hardness (SH) and infiltration capacity (IC) were analysed. The analysis of variance showed significant differences in treatments for all variables in both vegetation types, except for AW. The correlation showed that the BD has a positive relation with EC (0.472) and pH (0.398). The OM was negatively correlated with BD (-0.533), EC (-0.681) and pH (-0.300), and positively correlated with AW (0.268). Likewise, EC presented a negative correlation with AW (-0.347); in contrast showed a positive relation with pH (0.295). Comparing results with the control, treatments RA11 and BA11 increased OM to 100 % in MS and 200 % in RS. Also the RA11 and BA11 treatments showed a decrease in BD between 12 and 20 % in RS. In contrast the treatment RA11 showed a decrease of 6 % in BD in MS. The EC increased by 100 % in treatments BA11 and RA11. Also, CP decreased in a range between 5–82 % in all treatments in MS. In contrast the CP increased 300 % in RA11 in RS vegetation. The IC increased in 15 % in MS and 59 % in RS using BA11, in contrast decrease was observed in RA08 and RA11 (70 and 65 %) in MS; while the IC decrease only 10 and 5 % in same treatments in RS. The SH in the MS decreased in all treatments compared to C, showing higher decreases in BA11 (44 %) and RA04 (53 %). Also, SH decreased 50 % in RA04 and RA11 in the RS, in contrast increased 75 % in RA08. Results indicated that after using aerator roller, in the first three years OM increased and BD decreased. In contrast, after a period of 6–10 years (RA04 and RA08) the OM decreased and the BD increase.

Keywords: Chihuahuan desert, desert microphyllous scrubland, desert rosetophyllous scrubland, hydro-edaphological properties, roller aerator