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Full Length Research Paper

Long-term effects of different burning frequencies on the dry savannah grassland in South Africa

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Abstract

The use of fire in the management of grassland is a common rangeland practice in South Africa. This portends ecological implication for the sustainability of the savannah rangelands as a system. A long term trial was established in August 1980 at the University of Fort Hare, to evaluate the effects of this practice and determine the frequency of burning that yield optimum benefits. The experimental treatments consisted of five different burning frequencies, viz., no burning (K), annual burning (B1), biennial burning (B2), triennial burning (B3), quadrennial burning (B4) and sexennial burning (B6). Surface soil chemical characteristics and macro fauna densities were assessed from each experimental unit after 25 years of treatments implementation. Burning significantly affect the surface soil concentration of total N, organic C, exchangeable K, Mg and Na, but soil pH increased slightly in the short run. The macro fauna density was significantly higher in the annual, biennial and triennial burned plots compared with the unburnt plots. The soil macro fauna density increased by 31.4% in the B1 plots, while

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longer burning frequencies (B2- B6) ranged between 15.1 – 51.4% which increases with reduced frequency of burning until a peak at B3 and thereafter a reduction. A significant inverse correlation ($r = -0.56^*$) was observed between the grass biomass and fauna density. There was also a relative reduction of 23% in grass biomass in the frequently burnt plots (B1). The B3 plots had the highest suitability index of 44, which indicated the frequency of burning at which optimum benefit could be derived based on the measured variables. Frequent burning of savannah grassland led to reduction of surface grass biomass and increase in the soil organic carbon content which we speculated to be due to increase in underground carbon pool from dead roots.

Key words: Fire treatment, rangeland management, soil nutrients, soil macro fauna, grass biomass.

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