

## Impacts of woody invader *Dillenia suffruticosa* (Griff.) Martelli on physical, chemical and biological properties of soil

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### Abstract

Invasive alien species (IAS) cause irreversible changes to abiotic and biotic properties of ecological communities, hence become a worrying problem at the global scale. Para, (*Dillenia suffruticosa* (Griffith) Martelli. – Family - Dilleniaceae), that spread fast in low-lying areas in wet zone of Sri Lanka, is currently listed as a nationally important IAS that deserves attention in ecological studies. Thus, impact of this woody invader on physical, chemical and biological properties of soil was investigated. Five sampling sites were identified along a total distance of 46 km from Avissawella to Ratnapura. At each site, two adjacent plots (1 m x10 m each for *D. suffruticosa* present D+ and absent D-) were outlined.

Soil physical, chemical and biological properties were determined using standard procedures and compared between D+ and D- by ANOVA using SPSS software. Rate of decomposition of *D. suffruticosa* leaves was also determined using the litter bag technique at 35% and 50% moisture levels. Above ground plant species richness was compared using Jaccard and Sorenson diversity indices. Particle size distribution was related to soil texture and D+ soil showed a much higher percentage of large soil particles. Further, higher % porosity together with lower bulk densities for almost all D+ sites was a clear indication that the soil was affected. The results for pH were always significantly lower for D+ than D- thus developing acidic soils whereas conductivity has been significantly high making soil stressed. Cation Exchange Capacity (CEC) in almost all the sites showed a significant drop with D+ further indicating that soils were highly disturbed due to the presence of this invasive plant. This was a remarkable finding to be concerned with as soil fertility/quality largely depends on CEC. Nitrate in the present study showed varied results. Significantly higher values in the phosphorous content of soil were reported in D+ soil in all the sites and this may be attributed to the high decomposition rates recorded and the chemical compounds present in *D. suffruticosa* leaves.

The results obtained for microbial biomass were unexpected as no impact from *D. suffruticosa* was reported although both soil physical and chemical parameters indicated some degree of soil degradation. However, higher biomass values recorded for almost all the D+ sites together with significantly higher number of bacterial colonies could be related to the unexpectedly recorded higher Organic Carbon. When decomposition rate of *D. suffruticosa* leaves was considered, it was 0.014g/day and 0.011 g/day respectively at 35% and 50% moisture levels. This clearly shows that the leaves of this plant are highly susceptible for decomposition irrespective of moisture. It seems that decomposition rate is the main parameter that governs the microbial biomass despite of the negative impacts on the physical and chemical properties of soil by *D. suffruticosa*. Both the Jaccard and Sorenson indices indicated that D+ and D- sites were dissimilar with respect to above ground plant species richness. Thus, changes in soil

properties due to the growth of invasive *D. suffruticosa* were identified and further studies are needed before concluding on the degree of soil deterioration.

**Key words:** *Dillenia suffruticosa*, impacts, soil