ABSTRACT

Investigations were made to provide a quantitative description of the grassland vegetation of Hantane range, a hill range in Kandy District, Sri Lanka, using some of the mathematical multivariate techniques, to estimate the natural productivity, and to explore the effect of human interference on the phytosociology and dynamics of the grassland. An attempt was also made to elucidate experimentally the factors controlling the distribution, performance, abundance, phenology and population dynamics of some of the more important grass species. Most of the experimental studies were carried out with Cymbopogon nardus, Eulalia trispicata, Pennisetum polystachyon and Themeda tremula.

The multivariate analysis of floristic data, using reciprocal averaging ordination and association-analysis classification, revealed the phytosociological distinctiveness of different hills of the Hantane range; both inter-hill vegetational variations were found to be related to the individual and combined effects of altitude, microclimate, moisture regime, nutrient status and textural properties of the soil and the degree of human interference such as clipping and burning.

The within community distribution of four dominant grasses was investigated by pattern analysis which revealed the existance of three pattern scales. The

primary pattern scale of Eulalia trispicata was attributed to restricted seed dispersal, and of Cymbopogon nardus, Pennisetum polystachyon, and Themeda tremula to their morphology. The secondary pattern scale of Eulalia trispicata and Cymbopogon nardus was related to soil compactness; the former species is more abundant in compact than in loose soil while the reverse is true of the latter species. The highest scale of pattern of Cymbopogon nardus, which is relatively more abundant in hollows than on hummocks, was attributed to soil microtopography, while that of the other three species was interpretted as an inverse pattern imposed upon them by the pattern of Cymbopogon nardus.

The natural productivity of grassland is generally low and is somewhat higher (at higher than) at lower altitudes. The low overall productivity is attributed to nutrient defficiency and the altitudinal differences in productivity were related to differences in the soil moisture regime and floristic composition. The effects of experimental clipping and burning were to modify the floristic composition of the grassland and to reduce the vigour, and growth of the dominant grasses. The experimental interference was found to be harmful to naturally occuring species and to favour the colanization of weeds, of which Pennisetum polystachyon, a notorious graminacious weed, is the most important.

In pot experiments investigating the interference between the four dominant grasses, Pennisetum polystachyon was found to suppress and Eulalia trispicata to be suppressed by all the other species; Themeda tremula suppressed Cymbopogon nardus. The degree of these suppressions was further intensified by clipping. However, the established populations were quite effective in suppressing the late-sown seedlings irrespective of the aggressiveness of the species.

The growth of the dominant grasses was restricted by sub-optimal levels of soil moisture and nutrient regime, and their germination in the field was shown to be controlled by an interaction of dormancy, light, temperature and edaphic factors such as moisture regime, surface heterogenity and depth of burial.

The ecological implications of the results are briefly discussed with particular emphasis on the deleterious effects of human interference and conservation of the grassland ecosystem.