

SOIL-PLANT COMMUNITY RELATIONSHIPS IN DISTURBED AREAS IN THE VICINITY OF KARACHI, PAKISTAN

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ABSTRACT

Four different vegetation types were identified in the disturbed areas in the vicinity of Karachi based on floristic and physiographic conditions. *Cressa-Salsola*, *Prosopis*, *Suaeda* and *Senna* were the main communities in the disturbed areas. *Cressa-Salsola* was the most dominant community in which sodium was high (2957) with least potassium (167 ppm) and little organic matter (0.9%). *Prosopis* community was also dominant in the disturbed area. The soil contained high potassium (519 ppm), organic matter (1-2%) and least calcium carbonate (23.8%). *Suaeda* community was found in soil with least sand (54.1%) but high water holding capacity (32.1%), organic matter (1.1%) and pH (8.1). *Senna* was the least abundant community with high sand and calcium carbonate. However, organic matter (0.7%) and sodium (700 ppm) are less in the soils of this community as compared to other communities.

Key words: Human activity effect, Soil-Plant Community relationships.

Introduction

Vegetational disturbance is mostly caused by human activities such as cutting, grazing by animals constructions, industries, etc. These activities cause changes in vegetation types and soil properties. However both are also governed by a complex of natural environmental factors including climate, soil properties. However both are also governed by a complex of natural environmental factors including climate, soil geology, topography and biota [3]. In this work an attempt has been made to study the interrelationships between the plant communities and soil properties in disturbed areas of Karachi.

Material And Methods

In a study area about 2 ha in size near Karachi, which has been mainly disturbed by human activities (e.g. cutting, grazing by animals, construction of buildings, etc.) The Vegetation was surveyed by the method of Curtis [1] and Curtis & McIntosh [2]. The relative density, cover and frequency for each dominant species were determined. An importance value is a percentage figure calculated by the addition of relative density, relative cover and relative frequency and divided by three ($D_3 + C_3 + F_3$). Soil analyses were performed by standard methods of USDA [7].

Results And Discussion

Four different vegetation types were recognized: (1) The *Cressa-Salsola* community, the most dominant community with average importance value 40.0% was found in areas where the soil contained the most exchangeable sodium (2957 ppm) and highest pH (8.1) value, least potassium (167 ppm) and little organic matter (0.9%) [Table 1]. *Cressa cretica* L. and *Salsola baryosma* (R. & S.) Dandy are the important members of the community. (2) The *Prosopis* community comprises *Prosopis juliflora* DC and *Prosopis glandulosa* Torr., and has an importance value of 26.9%; this was also a dominant community in the area. These two species are considered to indicate disturbed areas (shafiq et al.) [5]. The soil contained the most potassium (519 ppm) and organic matter (1.2%) and the least calcium carbonate (23.8%) and pH (7.9) values. (3) The *Suaeda fruticosa* (L.) community had an importance value of 38.1%. it was found in soil with least sand (54.1%) but high water holding capacity (32.1%), organic matter (1.1%) and pH (8.1). Sodium and potassium concentrations were intermediate in this community. (4) *Senna holosericea* (Fresen.) Greuter, on the other hand, was the least abundant community in the area with an importance value of 46.0%. The sand and calcium carbonate contents were the largest, 74.5 and 32.0%, respectively.

Table 1. Soil characteristic of different communities (Standard errors shown in parenthesis)

Communities	Importance Value %	Sand %	MWHC %	CaCO ₃ %	Organic Matter %	pH	Exchangeable	
							Na Ppm	K Ppm
Cressa-Salsola	a 40.0 (2.4)	a 65.4 (3.5)	a 30.1 (2.0)	A 28.4 (0.9)	a 0.9 (0.1)	a 8.1 (0.5)	a 2957 (30)	a 167 (3)
Prosopis	b 26.9 (1.2)	a 74.2 (3.6)	a 30.0 (2.0)	A 23.8 (0.9)	a 1.2 (0.2)	a 7.9 (0.4)	c 1225 (168)	a 519 (4)
Suaeda	a 38.1 (3.8)	a 54.1 (3.2)	a 32.1 (3.8)	A 29.8 (5.8)	a 1.1 (0.1)	a 8.1 (0.3)	b 1853 (44)	b 293 (2)
Senna	a 46.0 (1.1)	a 74.5 (18.1)	a 27.8 (4.9)	A 32.0 (0.1)	a 0.7 (0.1)	a 8.0 (0.3)	d 700 (58)	c 205 (2)

MWHC Maximum Water Holding Capacity

Statistical significance determined by analysis of variance. Numbers followed by the same letter in the same column are not significantly different ($p < 0.05$) according to Newman-Keuls Multiple Range test.

However, organic matter (0.7%) and sodium (700 ppm) were less in the soils of this community than in any other. In the above mentioned communities, though, the differences were observed in different edaphic conditions but the significant ($p < 0.05$) differences were found regarding the exchangeable sodium and potassium.

The investigation indicated an inter-relationship between the communities and soil conditions. Cressa-Salsola community prefers land with high sodium and low potassium, whereas the Prosopis community occurs in soil with high potassium, whereas the comparatively low CaCO₃. Similar results were also obtained by [5] & [6] according to their investigation. calcium carbonate was least (27.0%) in community was found in soil which had low percentage of sand, and Senna community preferred high sand, CaCO₃, low maximum water holding capacity, organic matter and sodium.

The undisturbed plant communities have been determined by Qadir *et al.* [4] on the Karachi University campus. They found few communities like Capparis-prosopis-commiphora, Cordia-Grewia-Prosopis, Cordia-zizyphus-Grewia, Acacia-Indigofera-zizyphus and Euphorbia-Grewia-Acacia. All these communities have distinct edaphic and physiographic characteristics. Most importantly, these communities were not disturbed by human activities. However, in the present study, most of the communities have been disturbed by anthropological and animal interference, resulting the occurrence of some other communities like Cressa-Salsola, Prosopis, Suaeda and cressa. These communities have been designated as indicator communities of the disturbed areas in the vicinity of Karachi.

The study revealed that the soil is sandy containing a lot of calcium carbonate and exchangeable sodium and low organic matter.

In the community, where Prosopis is dominant, the soil contained sufficient amount of exchangeable potassium and comparatively low sodium and calcium carbonate. These sites may be further developed by transplanting some useful and palatable plants like Prosopis Cinerarea, Acacia nilotica and zizyphus spp. These species have been observed by Qadir et al. [4] in the undisturbed areas in Karachi.

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