VEGETATIONAL VARIATION AND SOIL CHARACTERISTICS AROUND THE RAILWAY TRACK AND SHAHRAH-E-FAISAL IN KARACHI

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ABSTRACT

Vegetational variation and soil characteristics were studied around the polluted areas from Cantt Station - Quaidabad Chowrangi along railway track and Shahrah-e-Faisal by "Point Centred Quadrant Method". Eighty six species were recorded from the entire study area. Eleven communities were noted based on the first dominance in all thirty stands. Most of the species were disturbed while some of them halophytic in nature. *Prosopis juliflora* L. and *Tribulus terrestris* L. showed more dominance with presence class V, having highest total Importance Value Index (IVI) 954.40 and 946.28 respectively. *Abutilon fruticosum* L. was dominant specie having IVI 585.81 with presence class IV. *Sida tiagii* L. attained dominance with presence class III and total IVI 257.77. *Cressa critica* L., *Euphorbia hirta* L., *Corchorus trilocularis* L. *Trichodesma amplxicaule* Roth, *Fagonia indica* L. and *Salvadora persica* L. were dominant having IVI 541.61, 321.00, 239.05, 237.64, 208.55, 109.36 respectively with presence class II. *Convolvulus arvensis* L. appeared as dominant having IVI 94.44 with presence class I. *P. juliflora, T. terrestris, C. cretica, A. fruticosum, E. hirta, T. amplexicaule and C. arvensis* preferred sandy clay loam. *F. indica* and *S. persica* like clay loam. *C. trilocularis* and *S. tiagii* preferred loam and silt respectively. Soil was mostly basic but in few stands acidic in nature. *A. fruticosum has* maximum water holding capacity (33.88%), porosity (51.00%) and sulfur (150.12µg^{-g}) than all other communities. *Salvadora* and *Fagonia communities* preferred the soil having more quantity of organic matter (6.00 %) as compared to other communities of the study area. *T. amplexicaule* was found in the soil having greater quantity of bulk density. *S. tiagii* community soil contain highest percentage of $CaCO_3$ as compared to other communities. *C. cretica, F. indica* and *C. arvensis* favored more electrical conductivity as compared with other communities. *P. juliflora, Cressa cretica, F. indica, S. persica, T. amplexicaule and C. arvensis* community soils have high values of sodium (421, 740, 240, 1340, 540,

330, 2740ppm) respectively. While, *P. juliflora*, *A. fruticosum*, *F. indica* and *S. tiagii* preferred more quantities of potassium (120, 140, 180, 140ppm) respectively as compared to other communities.

KEY WORDS

Phytosociology, plant communities, Pollution, Railway, soil

INTRODUCTION

Karachi is the 22nd biggest city of the world and is the largest city of Pakistan. It is situated at 64° longitudes and 27° latitude on the shore of Arabian Sea near the Indus River delta. The city covers an area of approximately 3,530 square kilometres (1,363 square miles) with more than 18 towns and 6 cantonment boards. It comprised largely of flat or rolling plains, with hills on the western and Manora Island and the Oyster Rocks. The Arabian Sea beach lines the southern coastline of Karachi. Mangroves and creeks of the Indus delta can be found towards the south east side of the city. Strong costal winds, temperature and relatively high humidity are the physical factors which are in direct contact with the study area. Karachi city is suffering by a series of environmental problems due to increase in population growth, automobile activities, solid refuse burning, domestic fuel burning and industrial activities. Transport system to serve as the means for carrying people and goods from one place to another. The buses, minibuses and locomotive train are the primary modes of city conveyance. Pakistan railway system links Karachi to other cities of Pakistan. The traffic system in city is not only noisy but also producing hazardous environmental effects on plants. Most of the automobiles emit black smoke due to incomplete combustion of fuel. Toxic materials such as carbon particles, unburned and partially burned hydrocarbons, fuels, tar materials, lead compounds and other elements which are the constituents of petrol and lubricating oils deposit on the surface of plants. These pollutants in combinations cause greater or synergistic effects to plants (Qadir & Iqbal, 1991). Vehicle populations are mostly composed on motor cycle, auto rickshaw, cars, jeeps, mini buses, buses, trucks and railways. The pollutants are entering in the environment; ecological related problems are increasing day by day. The sources of pollutant in air, water and soil are varied according to their nature of dispersion and other environmental conditions prevailing in the affected areas. The releasing of different types of pollutants varying in their nature and cover a wide range of effects on plants both quantitatively and qualitatively.

The problem of environmental pollution can be related to the poor quality of fuel available in the market and as a result vehicles emit more particulate matter (PM), carbon monoxide (CO), nitrogen oxides (NO_X) and hydrocarbons (HC) in the atmosphere. CO, HC, and benzene emissions are high in gasoline vehicles compared to diesel vehicles. The age of the vehicles contribute more pollutants. Lead is a ubiquitous metal in the environment that induces a broad range of physiological, biochemical·and behavioral dysfunctions (Toplan, *et al.*, 2004). Exposure to lead (Pb) as well as other heavy metals in the environment is still a matter of public health concern (Rinderknecht, *et al.*, 2005). Emission of Pb from petrol driven motor vehicles in Karachi was estimated to be about 125 tones per annum in 1989 (Beg, 1990). Yousafzai (1991) found the level of Pb (8104527 ppm) and Cd (0.2-4.5 ppm) in the street dust of metropolitan city of Karachi and concluded that Pb in roadside dust of Karachi city was mostly attributed by leaded gasoline from vehicular traffic. An enhancement of lead in the levels was found in roadside soil and vegetation due to combustion of leaded petrol by automobile exhaust in Baghdad city (Khalid, *et al.*, 1981). The concentration of pollutant in soil is at its highest in many larger and industrial cities and seriously contributing toxic effects on biota of the region. The damage has been increased considerably since the last few years. Pollutant released from various sources has brought changes in the nature, structure and composition of the biological communities and could involve in the extinction of some important species. The damage may occur at any stage of plant growth and on any parts of the plant. High levels of heavy metals were investigated in the soil samples from various polluted areas of Karachi city (Khalid, *et al.*, 1996). Iqbal *et al.*, (1998) carried out a survey of vegetation and trace metals (Cu, Zn and Pb) in soils along the super highways near Karachi city. Plant and soils near the roadside had a higher concentration of Pb than at a distance of 4-6 meters. A good correlation existed between traffic volumes, total and extractable soil Pb and Pb content of roots and shoots of the grass *Cynodon dactylon* in roadside of Delhi (Dutta & Mookerjee, 1981). Lead concentrations up to several thousands parts per million in street dirt and soils are frequently found in urban areas or near certain types of industry (Barltrop *et al.*, 1974). The major sources of lead available to plants has been the soil usually derived from weathered bedrock, parents material from lead mine, smelting operations, use of lead arsenate, use of tetraethyl and tetra methyl lead as anti knocks additive to petrol (Foy *et al.*, 1978). Motor vehicles activities in city of Karachi, contributed about 7,000 tones per annum of suspended particulate matter (Ghauri, *et al.*, 1988). Excessive amount of toxic element usually caused reduction in plant growth (Prodgers & Inskeep, 1981). Roadside trees in the city are coming under pressure and are lost due to vehicular-traffic infrastructure and other community needs (Jim, 1998). Trees in cities face a severe limitation of plantable space and an exceptionally stressful growing environment such as air pollution, environmental degradation, pressure for land space, traffic congestion, destruction of trees and green areas to accommodate urban development which suppresses performance and shorten life span (Gilbertson & Bradshaw, 1985; Jehan & Iqbal, 1992; Sawidis, *et al.*, 1995; Jim, 1996, 1997, 1998, Webb, 1998).

Soil analysis was done by many workers in previous years to show the effects of soil on plant communities. Soil texture (sand, silt and clay). maximum water holding capacity, percentage of calcium carbonate, percentage of organic matter and pH were analyzed by Iqbal, *et al.* (1983); Shafiq and Iqbal (1987); Mehmood and Iqbal (1995) in the vicinity of many industries. Soil was also analyzed for available sulfur by Iqbal and Zaman (1993).

In the previous years some of the vegetational study around Karachi was conducted by many workers (Ahmed, *et al.*, 1978; Iqbal and Qadir, 1974; Shafiq and Iqbal, 1987).

No work has so for been done about phytosociology around the railway track and Shahrah-e-Faisal from Cantt Station to Quaidabad Chowrangi. The aim of this work was the quantitative estimation of the vegetation along with soil analysis to find out the impact of automobile pollutants on nature, structure and composition of vegetation.

MATERIALS AND METHODS

A phytosocialogical survey was conducted around the polluted area (Cantt Station to Quaid-Abad chowrangi) near the railway track and shahrah-e-faisal Karachi. Sampling was done during November in 2006 by Point Center Quarter Method of Cottom and Curtis (1956). During the survey, 30 stands were marked and in each stand 20 sampling points were taken randomly. Vegetational characters for each stand like the relative and percentage frequency, density per acre and relative density, cover per acre and relative cover of each species were calculated. The relative values of all the three measures were combined by summation into a single important value index (IVI) following the practice of Curtis and McIntosh (1950). The community for each stand was named according to three dominant species which had the highest important value index.

Stands used for vegetation analysis were subjected for soil sampling. Two soil samples were obtained from every stand at 0-1 feet depth and were brought to the laboratory in polythene bags for physical and chemical analysis. The soil samples were air dried for three days, crushed and then sieved through 2 mm sieve. Each test was performed for two times in order to minimize the error and their mean values were calculated.

Mechanical analysis of soil was carried out in order to determine sand, silt and clay in percentage by Bouyoucos (1962) Hydrometer method. Maximum water holding capacity (M.W.H.C.) of soil was calculated by the method of Keen (1931). Bulk density was calculated in g^{-cc} with relative density bottle according to (Birkeland, 1984). Soil porosity was determined with the help of the following formula:

$$\text{Porosity} = 1 - \frac{\text{Bulk density}}{\text{Particle density}}$$

Calcium carbonate was determined by treating 10g of soil with 10% HCl until the effervescence ceased, the solution was filtered and the loss in weight gave the approximate $CaCO_3$ contents of soil (Qadir *et al.* (1966). Soil pH was determined by direct MP220 pH reading meter (Mettler, Toledo). Chlorides were determined through titration by Mohr's Method (Allen *et al*., 1974). Estimation of organic matter in percentage was done according to Jackson (1958). Total organic carbon was calculated by converting organic matter by using the conversion factor 1.724 (organic matter / 1.724 = organic carbon) as recorded by Nelson and Sommers (1988). Soil available sulfur was indomitable by the turbidity method as described by Iqbal (1988). Electrical Conductivity (E.C.) and Total Dissolved Salts (T.D.S.) were determined by direct AGB 1000 electrical conductivity meter. Exchangeable sodium and potassium were calculated as described by Richard (1954).

RESULTS

The data of study area was analyzed to determine important value index (IVI) of each species in *juliflora* DC., *Tribulus terrestris* L., *Cressa cretica* L., *Abutilon fruticosum* L., *Euphorbia hirta* L., *Corchorus trilocularis* L., *Fagonia indica* L., *Salvadora persica* L., *Trichodesma amplexicaule* Roth., *Convolvulus arvenses* L. and *Sida tiagii* L. showed first dominance and formed eleven communities.
In study area, out of 30 stands, 8 stands showed the presence of *P. juliflora* as a leading first dominant species, *T terristris* was present in six stands as a leading first dominant. Both these species showed very strong association with each other. *C. cretica* showed leading first dominance in 5 stands, *A. fruticosum*, *E. hirta*, S. *tiagii* and *C. trilocularis* showed leading first dominance two times. *T. amplexicaule*, *F. indica*, *S. persica* showed leading first dominant only one time. These plant communities, as a leading first dominance in polluted area and were correlated with the edaphic factors.

1) *Prosopis* community. *P. juliflora* formed main association with disturbed species, *Tribulus terristris*, *Corchorus depressus*, *Comicarpus sp.*, *Mollugo lotiodes* L., *A. javanica*, *Zelia pentendra*, *A. fruticosum*, *Salvadora persica* and with halophytes C. *cretica*, *Heliotropium ramosissum and F. indica*. This community preferred higher percentage of sand (54.96 %) low percentage of silt (19.35 %) and clay (25.77 %) with soil structure sandy clay loam. Maximum water holding capacity was low (27.14%) and like moderate bulk density (1.45 g^{-cc}), porosity (45 %), calcium carbonate (16.4 %), pH (7.62) organic matter (2.72 %), total organic carbon (1.58g), sulfur (107.4μg^{-g}), electrical conductivity (3.4 dS^{-cm}), total dissolved salts (2.5 mg^{-L}), exchangeable sodium (421ppm) and potassium (120ppm) as compared to other communities (table 2).

2) *Tribulus* community: *T. terrestris* formed the relationship with disturbed species, *P. juliflora*, *A. fruticosum*, *Eragrastis ciliaris*, *Amaranthus viridis*, *Chloris barbatus*, *A. javanica*, *C. depressus* and with halophytes, *C. cretica*, *F. indica* and *Euphorbia hirta*. This community favored higher percentage of sand (56.51 %) with low percentage of silt (16.38 %) and clay (27.10 %) with a soil structure sandy clay loam. Maximum water holding capacity was low (27.73%) and preferred moderate bulk density (1.45g^{-cc}), porosity (45 %), calcium carbonate (16.65 %), pH was (7.29), organic matter (2.66 %), total organic carbon (1.54g), sulfur (112.70μg^{-g}), electrical conductivity (2.4 dS^{-cm}), total dissolved salts (1.6 mg^{-L}), exchangeable sodium (173ppm) and potassium (102ppm) as compared with other communities (table 2).

3) *Cressa* community: *C. cretica formed the strong organization with halophytes*, *Portulaca olaceracea*, *Heliotropium ophioglassum*, *H. zylanicum*, *Suaeda nudiflora* and some disturbed species, *P. juliflora*, *Calotropis procera Launaea nudicaulis*. This community preferred higher percentage of sand

(48.84 %) with low percentage of silt (25.66 %) and clay (25.50 %) with a soil texture sandy clay loam. Maximum water holding capacity was low (26.13) and reasonable bulk density (1.44 g^{-cc}), porosity (45 %), calcium carbonate (14.32 %), pH (7.38), organic matter (3.08 %), total organic carbon (1.79g), sulfur (98.50 μg^{-g}), electrical conductivity (10 dS^{-cm}) and total dissolved salts (7.32 mg^{-L}). This community resembling to have more exchangeable sodium (740ppm) and less potassium (84ppm) as compared to the other communities (table 2.)

4) *Abutilon* community: *Abutilon fruticosum* fashioned the relationship with disturbed species *T. terrestris,* and halophytes, *C. cretica and E. hirta*. This community also favored higher percentage of sand (53.08 %) low percentage of silt (22.50%) and clay (24.42%) by forming a soil texture sandy clay loam. This community also preferred high percentage of maximum water holding capacity (33.88 %), low bulk density (1.30 g^{-cc}) and more porosity (51.00%) moderate calcium carbonate (15.45%), pH was (7.32) and more contents of organic matter (4.00 %), total organic carbon (2.32g) and sulfur (150.12μg^{-g}). this community is also favored those soils which have fair electrical conductivity (1.6 dS^{-cm}), total dissolved salts (1.1 mg^{-L}) exchangeable sodium (115ppm) and potassium (140ppm) as compared with other communities (table 2).

5) *Euphorbia* community: *Euphorbia hirta* formed the community with *Eragrastis ciliaris*, *Z. pentendra*, *Aerva javanica* and *A. fruticosum.* This community also preferred mean higher percentage of sand (54.8 %) low percentage of silt (26.5%) and clay (18.7%) by forming a soil texture sandy clay loam. Maximum water holding capacity (28.15%), bulk density (4.48 g^{-cc}) and porosity (42.5 %) were low. This community favored low pH (7.25), organic matter (1.3 %), total organic carbon (0.75g), sulfur (81.87 μg^{-g}) and calcium carbonate (15.6%), electrical conductivity (3.6 dS^{-cm}), total dissolved salts (2.6 mg^{-L}) exchangeable sodium (240ppm) and exchangeable potassium (105ppm) as compared to other communities (table 2.)

6) *Corchorus* community: *Corchorus trilocularis* associated with disturbed species, *Z. pentendra*, *T. terrestris*, and with a halophyte, *E. hirta*. This community preferred mean percentage of sand (38.94 %), silt (32%) and clay (28.92 %) with a soil texture loam and low maximum water holding capacity (27.46%). Moderate bulk density (1.49 g^{-cc}), porosity (44.00 %), calcium carbonate (14.20%), pH was (7.95), organic matter (3.40 %), total organic carbon (1.97g), electrical conductivity (3.5 dS^{-cm}), total dissolved salts (2.3 mg^{-L}) exchangeable sodium (180ppm) and potassium (70ppm) and more contents of sulfur (145.75 μg^{-g}) were the characteristics features of this community (table 2b).

7) *Fagonia* community: *F. indica* shaped the strong union with halophytic specie C. *cretica* and *H. ramosissum.* This community also preferred mean percentage of sand (41.8 %) low percentage of silt (29.0%) and clay (29.2%) with soil texture clay loam and high water holding capacity (33.36%). Moderate bulk density (1.34 g^{-cc}), porosity (49.0%), calcium carbonate (14.20%), pH was (7.25) and more organic matter (6.0%), total organic carbon (3.48g), sulfur (142. μg^{-g}), electrical conductivity dS^{-cm}), total dissolved salts (14.1 mg^{-L}) exchangeable sodium (1340ppm) and potassium (180ppm) were the characteristic features adopted by this community (table 2b).

8) *Salvadora* community: *Salvadora persica* fashioned the organization with disturbed species *T. amplexicaule and P. juliflora.* This community preferred high percentage of sand (61.80 %), silt (6.00%) and clay (32.20 %) with a soil texture clay loam. This community favored low percentage of maximum water holding capacity (26.71 %) and moderate bulk density (1.34 g^{-cc}), porosity (49.00 %), calcium carbonate (13.00 %), pH (7.25). This community also preferred high contents of organic matter (6.00 %), total organic carbon (3.48g), sulfur (142.50 μg^{-g}) chloride electrical conductivity (5.5 dS^{-cm}), total dissolved salts (3.9 mg^{-L}) exchangeable sodium (540ppm) and potassium (100ppm) as compared to other communities (table 2b).

9) *Trichodesma* community: *Trichodesma amplexicaule* formed the association with disturbed species *Peristrophe bicaliculeata.* This community preferred high percentage of sand (54.80 %), silt (20.00%) and clay (25.20 %) with a soil texture sandy clay loam. Moderate maximum water holding capacity (24.31 %), bulk density (1.58 g^{-cc}), porosity (30.00 %), calcium carbonate (11.58 %), pH was (7.12), organic matter (3.60 %), total organic carbon (2.09g), sulfur (97.50 μg^{-g}), electrical conductivity (5.7 dS^{-cm}), total dissolved salts (4.2 mg^{-L}) exchangeable sodium (330ppm) and potassium (50ppm) are the characteristic features of this community (table 2b).

10) *Convolvulus* community): *Convolvulus* arvensis also formed the association with disturbed species. This community preferred high percentage of sand (57.08 %), silt (17.00 %) and clay (25.92 %) with a soil texture sandy clay loam and low water holding capacity (24.59 %). This community preferred moderate bulk density (1.55 g^{-cc}), porosity (41.00 %), calcium carbonate (1.55 %), pH was (8.04), organic matter (1.40 %), total organic carbon (0.81g), sulfur (90.00 μg^{-g}) and calcium carbonate (1.55 %), high electrical conductivity (8.2 dS^{-cm}), total dissolved salts (6.0 mg^{-L}) exchangeable sodium (2740ppm) and potassium (120ppm) (table 2b).

11) *Sida* community: *Sida tiagii* formed the association with halophytic species, *E. hirta and Aerva javanica.* This community preferred very low percentage of sand (9.80 %), high percentage of silt (82.00 %) and very low clay (8.20 %) with soil textural class silt. This community preferred high water holding capacity (33.53%) and moderate bulk density (1.49 g^{-cc}), porosity (43.00 %), calcium carbonate (17.70 %), pH was (7.39), organic matter (2.50 %), total organic carbon (1.45g), electrical conductivity (2.1 dS^{-cm}), total dissolved salts (1.5 mg^{-L}), high sulfur (103.75 μg^{-g}), exchangeable sodium (160ppm) and potassium (140ppm) as compared to other communities (table 2b).

DISCUSSION

The concept of suitable habitat for the establishment of plant communities for naturally occurring vegetation type is the basis of plant ecology. In other words, the current vegetation type in an area is considered best adapted to the existing environmental conditions. However, the effect of habitat deterioration often results in heterogeneous trends. The forthcoming challenge in plant ecology is the understanding that how patterns and processes vary with environmental gradients and prediction of phytosocialogical trends that determines the species composition of communities (Rydgren, *et al*., 2003). Vegetation of any area is governed by complex of environmental factors including climate, geology, topography and biota (Major, 1951). The vegetation of study site (Cantt station to Quaidabad chowrangi) was found mostly disturbed and halophyte indicating the presence of *P. julijIora, A. fruticosum, T. terrestris, A. javanica, S. persica, T. amplexicaule, S. tiagii, Convolvulus arvensis, F. indica.* C. *cretica* and *E. hirta.* Similarly these species formed a strong association with each other like the vegetation of Korangi industrial area which was found as *P. juliflora, H. recurvum, Aeluropus sp. A. indicum,* C. *holosericea,* and C. *procera* (Shafiq and Iqbal, 1988). *P. juliflora* also with other disturbed species, C. *procera, A. javanica, A. indicum, and* C. *holosericea* formed a prominent community similar to the communities found around the cement industries of Karachi (Shafiq and Iqbal, 1987). *Prosopis, Tribulus, Abutilon, Euphorbia* and *Sida* communities like higher values of calcium carbonate and lower percentage of organic matter which showed that these communities preferred to grow in arid areas. An appropriate amount of calcium carbonate, poor amount of organic matter is a characteristic feature of arid zone soils (Aubert, 1960). *Prosopis* community recorded on the highest percentage of sand with lower percentage of silt and clay, higher pH value, higher calcium carbonate contents as compared to *Abutilon* and *Fagonia* communities which were commonly investigated as dominant communities in polluted areas. The soil pH and the percentage of calcium carbonate upon which the vegetation greatly depends have been shown to have a considerable bearing on the pattern of compositional variation in arid and semi-arid regions and were also correlated with the vegetational composition (Qadir *et al*., 1966, Ayyad & Ammar, 1974). But *Fagonia* community had larger amount of sulfur contents, organic matter and maximum water holding capacity as compared to *Prosopis* and *Abutilon* communities in polluted areas. An enhancement of Pb was found in roadside soil and vegetation due to combustion of petrol by automobile exhaust in Baghdad city (KhaIid, *et al.*, 1981). A good correlation was found between traffic volumes, total and extractable soil Pb and Pb content of roots and shoots of the grass *Cynodon dactylon* in roadside of Delhi (Dutta and Mookerjee, 1981). The vegetation in polluted areas near railway track and busy roads of Karachi is mostly disturbed type due to construction and repairing of railway track and roads. Vegetation around railway track and roads changes gradually year after year by grazing and some other factors. Impact of grazing on vegetation is additional source of disturbances in the area. In the Netherlands, grazing of livestock in marshes affects plant species composition and reduces vegetation height, making the marshes more attractive to herbivorous geese (Bos, *et al.,* 2005).

Pollutants released from various sources have brought several changes in the nature, structure and composition of biological communities and could involve in the extinction of some important species. The damage may occur at any stage of plant growth and on any part of the plant. High levels of heavy metals were investigated in the soil samples from various polluted areas of Karachi city (Khalid, *et al.,* 1996). Plants directly depend on soil characteristics and environmental factors for their growth and development. The plant communities which had higher percentage of soil organic matter and the water holding capacity of soil was consequently increased due to the colloidal nature of the organic matter (Singh, 1986).

The conclusion which could be drawn from this study is that all the vegetation types especially around the site (Cantt Station - Quaidabad chourangi) were disturbed by human activities, mainly by construction of railway track and roads and release of emission exhaust from different automobiles. If the haphazard population growth and the construction of new roads and railway tracks goes on then there would be likely more vegetative changes in near future.

REFERENCES

Ahmed, M., S.A. Qadir & S.S. Shaukat. 1978. Multivariate approaches to the analysis of the vegetation-environmental complex of Gharo, Dhabeji and Manghu Pir industrial areas. *Pakistan Journal of Botany, 10(1): 31-51.*

Allen, S.E., M.H. Grimshaw, J.A. Parkinson & C. Quarmby. 1974. Chemical analysis of Ecological Materials. In: Allen, S.E. (Ed.) Blackwell Scientific Publications, Oxford London, Edinburg, Melbourne, pp. 386.

Ayyad, M.A. & M.Y. Ammar. 1974. Vegetation and environment of the west Meditterranean costal land of Egypt. II. The habitat of inland ridges. *Journal of Ecology*, 62: 439-446.

Barltrop, D., D.D. Strehlow, I. Thornton & J.S. Webb. 1974. Significance of high soil lead concentrations for childhood lead burdens. *Environment Health,* 7: 75-82.

Birkeland, P.W. 1984. Soil and Geomorphology: Oxford University Press, New Yark, 14-15.

Bos, D., M.J.J.E. Loonen, M. Stock, F. Hofeditz, G.A.J. VanDer & J.P. Bakker. 2005. Utilisation of Wadden Sea salt marshes by geese in relation to livestock grazing. *J. Nat. Conserv.* 13: 1–15.

Bouyoucos, G.J. 1962. Hydrometer method improved for making particle size analysis. *J. of Agron.,* 53: 464.

Curtis, J.T. & R.P. McIntosh. 1951. An upland forest continuum in the praire-forest of Northern Wisconsin. *Ecology,* 32: 476-496.

Dutta, I. & A. Mookerjee. 1981. Lead in the soil and grass along roadsides of Delhi, India. *Proceeding of Indian National Science Academy (Biological Science),* 47: 58-64.

Foy, C.D., R.L. Chaney & M.C. White. 1978. The physiology of metal toxicity in plants. *Annual Review of Plant Physiology,* 29: 511-566.

Gilbertson, P. and A.D. Bradshaw. 1985. Tree survival in cities; the extent and nature of the problem. *Arboricultural Journal,* 9: 131-142.

Iqbal, M.Z., S.A. Qadir & M.Ahmed. 1983. Phytosociological studies around the polluted disposal channels of industrial areas of Karachi. *Pakistan Journal of Scientific and Industrial Research,* 26: 134-139.

Iqbal, M.Z. 1988. Accumulation of sulfur in foliage of roadside plantation and soil in Karachi city. *Ecology,* 29: 1-5.

Iqbal M.Z. & Q.U. Zaman. 1993. Sulfur in foliage and soil of the Korangi industrial area and university campus. *Pakistan Journal of 'Scient!fic and Industrial Research,* 36: 104-106.

Iqbal, M.Z., A.K. Sherwani. and M.Shafiq. 1998. Vegetation characteristics and trace metals (Cu, Zn and Pb) in soils along the super highways near Karachi, Pakistan. *Studia Botanica Hungarica,* 29: 79-86.

Jackson, M.L. 1958. Soil Cherilical analysis. Englewood Cliffs, N.J.: PrenticeHall, pp. 408.

Jehan, S. & M.Z. Iqbal. 1992. Morphological and anatomical studies of leaves of different plants affected by motor vehicular exhaust. *Journal of Islamic Academy of Science,* 5: 21-23.

Jim, C.Y. 1996. Roadside trees in urban Hong Kong: Part II species composition. *Arboricultural Journal,* 20: 279-298.

Jim, C.Y. 1997. Roadside trees in urban Hong Kong: Part IV tree growth and environmental condition. *Arboricultural Journal,* 21: 89-99.

Jim, C.Y. 1998. Pressure on urban trees in Hong Kong: Pervasive problem and possible amelioration. *Arboricultural Journal,* 22: 37-60.

Keen, B.A. 1931. The Physical Properties of Soil. New York: Longman Green and Company, pp. 380.

Khalid, B.Y., B.M. Salih & M.W. Issac. 1981. Lead contamination of soil in Baghdad City, Iraq. *Bulletin of Environmental Contamination and Toxicology,* 27: 634-638.

Khalid, F., Iqbal, M.Z. & M.S. Qureshi. 1996. Concentration of heavy metals determined in leaves and soil from various areas of Karachi city. *Environmental Science,* 4: 213-219.

Mehmood, T. & M.Z. Iqbal. 1995. Vegetation and soil characteristics of the wasteland of Valika chemical industries near Manghopir, Karachi. *Journal of Arid Environments,* 30: 453-462.

Nelson, D.W. & L.E. Sommers. 1996. Total carbon, organic carbon and organic matter. In: methods of soil analysis, part 2, 2nd ed., A.L. Page et al., Ed. Agronomy, 9: 961-1010.American Society of Agronomy. Incorporation Madison, WI.

Prodgers, R.A. & W.P. Inskeep. 1981. Heavy metals tolerance of inland salt grass *Distichlis spicata. Great Basin Naturalist,* 51: 271-278.

Qadir, S.A., S.Z. Qureshi & M.A. Ahmed. 1966. A Phytosocialogical survey of the Karachi University Campus. *Vegetatio,* 13: 339-362.

Qadir, N. & M.Z. Iqbal. 1991. Growth of some plants raised from polluted and unpolluted seeds. *International Journal of Environmental Studies,* 39: 95-99.

Richard, L.A. 1954. United State Lab. Staff Agricultural Handbook No. 60, United State Department of agriculture, pp. 129.

Rinderknecht, A. L., M.T. Kleinman & J.E. Ericson. 2005. Pb enamel biomarker: deposition of pre- and postnatal Pb isotope injection in reconstructed time points along rat enamel transect. *Environmental Research.* 99 (2): 169-176.

Rydgren, K., R.H. Okland & T. Okland. 2003. Species response curves along environmental gradients. A case study from SE Norwegian swamp forests. *Journal of Vegetation Science,* 14(6): 869-880.

Sawidis, T. & H.D. Reiss. 1995. Effects of heavy metals on pollen tube growth and ultra structure, *Protoplasma,* 185: 113-122.

Shafiq M. & M.Z. Iqbal. 1987. Plant sociology around stone quarries and processing plants of Karachi and Thatta Districts. *International Journal of Ecology and Environmental sciences,* 13: 33-39.

Toplan zcelik, D., T. Gulyasar & M.C. Akyolcu. 2004. Changes in hemorheological parameters due to lead exposure in female rats. *Journal of Trace Elements in Medicine and Biology,* 18 (2): 179-182.

Yousufzai, A.H.K. 1991. Lead and heavy metals in the street dust of Metropolitan city of Karachi. *Pakistan Journal of Scientific and Industrial Research,* 34: 167-172.

Table 1. Summary of importance value index (IVI) of species found around the railway track along the Shahrah-e-Faisal, Karachi.

S. No.	Name of plant species	Presence class	IVI				Total stands in which a sp. occurred	Total No. of stands which species dominant		
			Total IVI	Max. IVI	Min. IVI	Ave. IVI		1st	2nd	3rd
1.	*Prosopis juliflora* L.	V	954.40	86.59	7.8	32.91	29	8	3	2
2.	*Tribulus terrestris* L.	V	946.28	70.72	6.97	37.85	25	6	5	4
3.	*Abutilon fruticosum* L.	IV	585.81	67.94	10.68	25.47	23	2	2	2
4.	*Cressa critica* L.	II	541.61	83.10	8.64	45.13	12	5	2	3
5.	*Euphorbia hirta* L.	II	321.00	60.41	6.44	32.14	10	2	-	3
6.	*Aerva javanica* (Burm.f.) Juss.	III	278.85	42.40	2.85	19.91	14	-	1	5
7.	*Zelea pendendra* Boiss	III	260.74	35.61	9.17	17.38	15	-	1	2
8.	*Sida tiagii* L.	III	257.77	46.14	6.60	19.82	13	1	-	-
9.	*Corcchorus tricular* L.	II	239.05	63.07	10.09	23.90	10	2	-	-
10.	*Trichdesma amplexicaule* Roth	II	237.64	75.51	9.64	26.40	9	1	1	-
11.	*Launaea nudicaulis* L.	III	220.40	59.24	6.07	16.95	13	-	-	1
12.	*Fagonea indica* L.	II	208.55	58.89	6.10	26.06	8	1	1	1
13.	*Cassia holosericea* Fress.	III	190.28	31.87	6.86	14.63	13	-	-	-
14.	*Chloris barbata* Sw.	II	183.21	31.40	7.27	16.65	11	-	-	1
15.	*Amaranthus viridis* L.	II	173.70	48.11	7.29	17.37	10	-	1	-
16.	*Tephrosia uniflora* Pers.	II	162.66	24.88	14.83	20.33	8	-	-	-
17.	*Corchors depressus* L.	II	152.90	36.66	8.87	10.92	10	-	2	-
18.	*Eragrostisciliaris(L.) R. Br.*	I	141.96	5.91	5.57	28.39	5	-	2	-
19.	*Heliotropium zylanicum* lamk.	I	135.85	46.04	9.97	27.17	5	-	1	2
20.	*Calotropis procera* (willd)	II	125.91	20.60	3.64	7.41	10	-	-	1
21.	*Euphorbia sp.*	I	125.00	60.41	5.53	31.25	4	-	1	-
22.	*Suaeda nudiflora* (Willd) moq.	II	114.38	38.59	7.46	14.29	8	-	1	1
23.	*Comicarpus*	I	110.50	28.05	7.04	22.10	5	-	1	1
24.	*Salvadora persica* L.	II	109.36	48.02	5.08	15.62	7	1	-	1
25.	*Suaeda nudiflora* Willd.	I	106.78	54.70	10.62	26.69	4	-	-	-
26.	*Convolvulus arvensis* L.	I	94.44	71.69	5.08	31.48	3	1	-	-
27.	*Leucaena leucocephala* Lam de wit	II	91.10	16.03	3.58	10.12	9	-	-	-

28.	*Convolvulus glumeratus* Choisy	II	85.07	19.08	2.97	12.15	7	-	-	-
29.	*Chenopodium album* L.	II	84.72	27.42	3.68	12.10	7	-	-	-
30.	*Peristrophe bicalyculate* (Wahl.) Nees	II	75.77	31.87	3.82	6.88	11	-	1	-
31.	*Capparis deciduas* (Forsk) Edgew	II	75.61	14.47	3.35	8.4	9	-	-	-
32.	*Datura alba* Nees	I	68.10	20.04	6.13	11.35	6	-	-	-
33.	*Suaeda fruiticosa* (L.) Forsk.	I	66.27	15.01	8.42	13.25	5	-	-	-
34.	*Portulaca oleracea* L.	I	60.13	21.01	6.82	12.02	5	-	1	-
35.	*Rhynchosia pulverulenta* L.	II	56.35	19.38	2.82	8.05	7	-	-	-
36.	*Salsola baryosma* (R.& S.) Dandy	I	44.74	24.30	20.44	22.37	2	-	-	-
37.	*Achyranthus aspera* L.	II	42.32	8.32	2.27	5.29	8	-	-	-
38.	*Heliotropium curasavicum* L.	I	42.29	15.13	6.49	10.57	4	-	-	-
39.	*Salsola baryosms* (R.&S.) Dandy	I	44.74	24.3	20.44	22.37	2	-	-	-
40.	*Achyranthus aspara* L.	II	42.32	8.32	2.27	5.29	8	-	-	-
41.	*Lycium edgworthi* Dunal	I	37.75	10.61	8.39	9.43	4	-	-	-
42.	*Solanum surattense* Burm. f.	I	37.60	12.22	2.75	7.52	5	-	-	-
43.	*Digera muricata* (L.) Mart.	I	36.29	13.47	2.91	9.07	4	-	-	-
44.	*Heliotropium ramosissum* L.	I	35.41	35.41	35.41	35.41	1	-	-	-
45.	*Mollugo lotoides* (L.) O.K.	I	74.38	74.38	74.38	74.38	1	-	1	-
46.	*Zygophylum simplex* L.	I	34.45	12.76	3.25	5.74	6	-	-	-
47.	*Heliotropium ophioglossum* Stocks	I	30.30	30.30	30.30	30.30	1	-	1	-
48.	*Accacia senegal* Willd.	I	28.99	16.05	12.94	14.49	2	-	-	-
49.	*Sida ovata* Forssk.	I	28.59	20.22	4.07	9.53	3	-	-	-
50.	*Beta vulgaris*	I	26.45	14.02	12.43	13.22	2	-	-	-
51.	*Suaeda albus*	I	26.44	26.44	26.44	26.44	1	-	-	-
52.	*Rhynchosia minima* L.	I	26.26	11.55	7.23	8.75	3	-	-	-
53.	*Dactyloctenium scindicum* Boiss.	I	24.23	12.95	11.28	12.11	2	-	-	-
54.	*Withania somnifera* (L.) Dunal.	I	21.92	8.88	4.79	7.03	3	-	-	-
55.	*Coriza canadensis*	I	19.51	13.05	6.46	9.75	2	-	-	-
56.	*Abutilon pakistanicum* Jafri & Ali	I	19.14	19.14	19.14	19.14	1	-	-	-
57.	*Atriplex stocksi* Boiss.	I	18.54	11.61	6.93	9.27	2	-	-	-
58.	*Cleome viscose* L.	I	17.76	11.50	6.26	8.88	2	-	-	-
59.	*Pluchea lancelata* D.C.	I	17.38	14.43	2.95	8.69	2	-	-	-
60.	*Tridax procumbens* L.	I	14.13	14.13	14.13	14.13	2	-	-	-
61.	*Melilotus albus* Medik.	I	13.59	9.84	3.75	6.79	2	-	-	-
62.	*Convolvulus prostrates* L.	I	13.48	6.80	6.68	6.74	2	-	-	-

63.	*Allium cepa* L.	I	12.97	12.97	12.97	12.97	1	-	-	-
64.	*Vernonia cinerea* (L.) less.	I	12.46	12.46	12.46	12.46	1	-	-	-
65.	*Ipomoea carnea* Jecq.	I	11.33	11.33	11.33	11.33	1	-	-	-
66.	*Gynandropsis gynandra* (L.) Briq.	I	11.26	11.26	11.26	11.26	1	-	-	-
67.	*Indegofera oblongifolia* Forsk.	I	11.40	11.40	11.40	11.40	1	-	-	-
68.	*Acacia nilotica* (Lamk.) Willd.	I	10.93	10.93	10.93	10.93	1	-	-	-
69.	*Solanum nigrum* L.	I	10.03	10.03	10.03	10.03	1	-	1	-
70.	*Tephrosia subtriflora* Hochst.	I	9.83	9.83	9.83	9.83	1	-	-	-
71.	*Blepheris sindica* T. And.	I	9.12	9.12	9.12	9.12	1	-	-	-
72.	*Clitoria ternatea* L.	I	8.17	8.17	8.17	8.17	1	-	-	-
73.	*Polygala eriotera* DC.	I	8.04	8.04	8.04	8.04	1	-	-	-
74.	*Crotolaria burhia* Ham. ex Bth.	I	7.94	7.94	7.94	7.94	1	-	-	-
75.	*Phylanthus niruri* L.	I	7.17	7.17	7.17	7.17	1	-	-	-
76.	*Sesbanea sesban* (L.) Merrill.	I	6.95	6.95	6.95	6.95	1	-	-	-
77.	*Inula grantiodes* Boiss.	I	6.76	6.76	6.76	6.76	1	-	-	-
78.	*Boerhaavia diffusa* L.	I	6.38	6.38	6.38	6.38	1	-	-	-
79.	*Tamarix sp*. L.	I	6.36	6.36	6.36	6.36	1	-	-	-
80.	*Cenchris penisetiformis* Hochst.	I	6.32	6.32	6.32	6.32	1	-	-	-
81.	*Cadaba fruticosa* (L.) Druce	I	5.47	5.47	5.47	5.47	1	-	-	-
82.	*Cleome brachycarpa* Vahl	I	5.07	5.07	5.07	5.07	1	-	-	-
83.	*Oligocheata ramose*	I	4.45	4.45	4.45	4.45	1	-	-	-
84.	*Latipes senegalenses* Kunth	I	3.83	3.83	3.83	3.83	1	-	-	-
85.	*Physalis minima* L.	I	2.89	2.89	2.89	2.89	1	-	-	-
86.	*Alternanthera sessilis* (L.) R. Br.	I	2.66	2.66	2.66	2.66	1	-	-	-

Table 2a. Soil characteristics with relation to plant communities of railway track along the Shahrah-e-Faisal, Karachi.

Edephic characters	Plant communities				
	I *Prosopis juliflora*	II *Tribulus terrestris*	III *Cressa cretica*	IV *Abutilon fruticosum*	V *Euphorbia hirta*
	*9,11,13,18,20,23,24,25	*10,12,14,22,27,30	*4,5,6,7,8,	*21,28	*15,16
Sand %	54.96 **(67.00 – 45.08)	56.51 **(77.80 – 41.80)	48.84 **(57.80 – 38.80)	53.08 **(64.08 – 42.08)	54.80 **(60.80 – 48.80)
Silt %	19.35 **(32.00 – 4.80)	16.38 **(30.00 – 2.82)	25.65 **(39.20 – 17.00)	22.50 **(32.00 – 13.00)	26.50 **(31.00 – 22.00)
Clay %	25.77 **(29.92 – 22.92)	27.10 **(38.20 – 19.92)	25.50 **(29.20 – 22.00)	24.42 **(25.92 – 22.92)	18.70 **(29.20 – 8.20)
Soil type	Sandy clay loam **(Sandy clay loam – loam)	Sandy clay loam **(Sandy clay loam – loam)	Sandy clay loam **(Sandy clay loam – loam)	Sandy clay loam **(Sandy clay loam – loam)	Sandy clay loam **(Sandy clay loam – loam)
MWHC %	27.24 **(41.40 – 25.50)	27.73 **(30.53 – 20.05)	26.13 **(27.31 – 25.21)	33.88 **(36.78 – 30.98)	28.15 **(31.91 – 26.40)
B.D. g^{-cc}	1.45 **(1.55 – 1.29)	1.45 **(1.64 – 1.36)	1.44 **(1.54 – 1.21)	1.30 **(1.37 – 1.23)	1.48 **(1.55 – 1.40)
Porosity %	45.00 **(52.00 – 41.00)	45.00 **(49.00 – 38.00)	45.00 **(55.00 – 42.00)	51.00 **(54.00 – 49.00)	42.50 **(44.00 – 41.00)
$CaCO_3$ %	16.40 **(19.40 – 14.40)	16.65 **(19.10 – 9.50)	14.32 **(21.10 – 9.00)	15.45 **(16.20 – 14.70)	15.60 **(16.70 – 14.50)
pH	7.62 **(8.24 – 7.33)	7.29 **(7.95 – 6.70)	7.38 **(7.87 – 6.66)	7.32 **(7.33 – 7.31)	7.25 **(7.45 – 7.05)
O.M. %	2.72 **(5.00 – 1.00)	2.66 **(5.50 – 0.20)	3.08 **(5.20 – 0.50)	4.00 **(6.20 – 1.80)	1.30 **(1.61 – 1.00)
TOC g	1.58 **(2.900 – 0.58)	1.54 **(3.19 – 0.12)	1.79 **(3.02 – 0.29)	2.32 **(3.60 – 0.87)	0.75 **(0.93 – 0.58)
Sulfur μg^{-g}	107.40 **(147.50 – 71.25)	112.70 **(150.00 – 97.50)	98.50 **(120.00 – 88.75)	150.12 **(150.25 – 150.00)	81.87 **(92.50 – 71.25)
EC dS^{-cm}	3.4 **(10.1 – 1.2)	2.4 **(5.0 – 1.4	10.0 **(28.2 – 1.8)	1.6 **(1.7 – 1.5)	3.6 **(4.4 -2.8)
TDS Mg^{-L}	2.5 **(7.2 – 0.6)	1.6 **(3.6 – 0.5)	7.32 **(20.5 – 1.3)	1.15 **(1.2 – 1.1)	2.6 **(3.3 – 2.0)
Na ppm	421 **(1540 – 50)	173 **(320 -60)	740 **(2320 – 190)	115 **(120 - 110)	240 **(300 – 180)
K ppm	120 **(260 – 80)	102 **(140 – 40)	84 **(170 – 40)	140 **(200 -80)	105 **(160 – 50)

Symbol used: * Number of stands in which a species occurred.
**** Range of edhephic variables**

Table 2b. Soil characteristics with relation to plant communities of railway track along the Shahrah-e-Faisal, Karachi.

Edephic characters	Plant communities					
	VI *Corchorus triloculari*	VII *Fagonia indica*	VIII *Salvadora persica*	IX *Trichodesma amplexicaule*	X *Convolvulus arvensis*	XI *Sida tiagii*
	*26,29	*01	*02	*03	*19	*17
Sand %	38.94 **(77.88 – 45.80)	41.80	61.80	54.80	57.08	9.80
Silt %	32.14 **(38.28 – 26.00)	29.00	6.00	20.00	17.00	82.00
Clay %	28.92 **(28.92 – 28.92)	29.20	32.20	25.20	25.92	8.20
Soil type	Loam **(Sandy clay loam – loam)	Clay loam	Clay loam	Sandy clay loam	Sandy clay loam	Silt
MWHC %	27.46 **(27.68 – 27.25)	33.36	26.71	24.31	24.59	23.53
B.D. g^{-cc}	1.49 **(1.51 – 1.47)	1.34	1.34	1.58	1.55	1.49
Porosity %	44.00 **(45.00 – 43.00)	49.00	49.00	30.00	41.00	43.00
$CaCO_3$ %	14.20 **(14.80 – 13.60)	13.00	13.00	15.00	14.20	17.70
pH	7.95 **(8.01 – 7.89)	7.25	7.25	7.12	8.04	7.39
O.M. %	3.40 **(5.00 – 1.80)	6.00	6.00	3.60	1.40	2.50
TOC g	1.97 **(2.90 – 1.04)	3.48	3.48	2.09	0.81	1.45
Sulfur μg^{-g}	145.75 **(150.25 - 141.25)	142.50	142.50	97.50	90.00	103.75
EC dS^{-cm}	3.5 **(5.0 – 1.5)	19.6	5.5	5.7	8.2	2.1
TDS mg^{-L}	2.3 **(3.6 – 1.1)	14.1	3.9	4.2	6.0	1.5
Na ppm	180 **(300 – 60)	1340	540	330	2740	160
K	70	180	100	50	120	140

ppm	**(80 - 60)					

Symbol used: * Number of stands in which a species occurred.
**** Range of edhephic variables.**

Table 3. Physical analysis of polluted soil around railway track along the Shahrah-e-Faisal, Karachi.

S. N.	Locality	MWHC %	B.D. g^{-cc}	Porosity %	Sand %	Silt %	Clay %	Soil texture class
1	Cantt Junction	33.36	1.34	49	41.80	29.00	29.20	Clay loam
2	PAF Faisal (Meusium)	26.71	1.54	42	41.80	6.00	32.20	Sandy clay
3	PAF Faisal (Commander Residence)	24.31	1.58	30	54.80	20.00	25.20	Sandy clay loam
4	PAF Faisal (Caltex Pump)	26.65	1.54	42	45.80	25.00	29.20	Sandy clay loam
5	PAF Faisal (PSO pump)	25.21	1.48	44	57.80	17.00	25.20	Sandy clay loam
6	PAF Faisal (Shell Pump)	25.70	1.49	44	50.00	24.08	25.92	Sandy clay loam
7	PAF FaisalInformation & Selection Centre)	25.82	1.49	44	51.80	23.00	25.20	Sandy clay loam
8	PAF Faisal (Transit Deptt.)	27.31	1.21	55	38.80	39.20	22.00	Loam
9	Air Force Halt 17/5	27.83	1.415	46	48.80	22.00	29.92	Sandy clay loam
10	Air Force Halt (Shell Pump)	28.88	1.39	48	61.80	13.00	25.20	Sandy clay loam
11	Air Force Halt 17/12	36.25	1.29	52	45.80	29.00	25.20	Loam
12	Drigh Road (Opp. Mazar Maasoom Shah)	30.53	1.36	49	51.80	23.00	25.20	Sandy clay loam
13	Drigh Road (infront of Mazar Maasoom Shah)	25.50	1.47	45	67.00	04.80	28.20	Sandy clay loam
14	Drigh Road Junction	29.16	1.39	48	48.80	13.00	38.20	Sandy clay
15	NTC (Wireless gate)	26.40	1.55	41	48.80	22.00	92.20	Sandy clay loam
16	Malir Halt	31.91	1.47	44	60.80	31.00	08.20	Sandy clay loam
17	Malir (Nehal Hospital)	23.53	1.49	43	09.80	82.00	08.20	Silt
18	Malir (Atia Hospital)	31.40	1.55	41	57.80	17.00	25.20	Sandy clay loam
19	Malir (Dr. Khan Laboratory)	24.59	1.55	41	57.80	17.00	25.92	Sandy clay loam
20	Malir Station	28.90	1.49	44	45.08	32.00	22.92	Loam
21	Malir (New Era School)	36.78	1.23	54	64.08	13.00	22.92	Sandy clay loam
22	Malir (Al-Mansoor Garden)	27.4	1.48	44	57.08	17.00	25.92	Sandy clay loam
23	Malir (District Court)	30.40	1.39	48	64.08	13.00	22.92	Sandy clay loam
24	Malir (Muhammadi Shool)	29.35	1.43	46	60.08	11.00	28.92	Sandy clay loam
25	Malir (Prince Aly Academy)	27.73	1.54	42	51.08	26.00	22.92	Sandy clay loam
26	Malir (Paktel Tower)	27.68	1.51	43	45.08	26.00	28.92	Clay loam

27	Malir (Railway Police Chowki -1)	20.05	1.64	38	77.80	02.28	19.92	Sandy loam
28	Malir Stream	30.98	1.37	49	42.08	32.00	25.92	Loam
29	Malir (Railway Police Chowki -2)	27.25	1.48	45	32.80	38.28	28.92	Clay loam
30	Quaidabad Chowrangi (Gulistan Cricket Club)	30.41	1.44	45	41.80	30.00	28.20	Clay loam

Abbreviation Used: MWHC = Maximum Water Holding Capacity
B.D. = Bulk Density

International Journal of Scientific & Engineering Research Volume 9, Issue 5, May-2018 1840
ISSN 2229-5518

Table 3. Chemical analysis of polluted soil around railway track along the Shahrah-e-Faisal, Karachi.

S. N.	Locality	$CaCO_3$ %	pH	OM. %	TOC g	Sulfur μg^{-g}	EC dS^{-cm}	TDS mg^{-L}	Exchange-able Na (ppm)	Exchange-able K(ppm)
1	Cantt Junction	13.0	7.25	6.0	3.48	142.50	19.6	14.1	1340	180
2	PAF Faisal (Meusium)	16.9	7.30	1.8	1.04	110.00	5.5	3.9	540	100
3	PAF Faisal (Commander Residence)	15.0	7.12	3.6	2.09	97.50	5.7	4.2	330	50
4	PAF Faisal (Caltex Pump)	9.2	7.33	0.5	0.29	120.00	2.6	1.8	220	40
5	PAF Faisal (PSO pump)	14.7	7.33	5.2	3.02	90.00	1.8	1.3	190	60
6	PAF Faisal (Shell Pump)	21.1	7.87	3.0	1.74	101.25	15.1	11.4	440	60
7	PAF FaisalInformation & Selection Centre)	17.6	6.66	2.2	1.28	92.5	2.2	1.6	530	170
8	PAF Faisal (Transit Deptt.)	9.0	7.72	4.5	2.61	88.75	28.2	20.5	2320	90
9	Air Force Halt 17/5	19.4	7.47	3.1	1.79	80.50	2.2	1.6	150	260
10	Air Force Halt (Shell Pump)	19.1	6.70	3.7	2.15	108.75	2.2	1.6	90	110
11	Air Force Halt 17/12	17.6	7.56	3.8	2.20	88.70	6.1	4.3	80	100
12	Drigh Road (Opp. Mazar Maasoom Shah)	17.2	7.42	1.5	0.87	101.25	1.4	1.0	320	130
13	Drigh Road (infront of Mazar Maasoom Shah)	16.6	7.49	1.2	0.69	97.50	1.6	1.1	150	90
14	Drigh Road Junction	18.8	6.95	3.3	1.91	98.75	2.5	1.8	110	130
15	NTC (Wireless gate)	14.5	7.05	1.6	0.93	92.50	2.8	2.0	180	50
16	Malir Halt	16.7	7.45	1.0	0.58	71.25	4.4	3.3	300	160
17	Malir (Nehal Hospital)	17.7	7.39	2.5	1.45	103.75	2.1	1.5	160	140
18	Malir (Atia Hospital)	17.0	7.91	1.0	0.58	143.75	1.2	0.9	50	120
19	Malir (Dr. Khan Laboratory)	14.2	8.04	1.4	0.81	90.00	8.2	6.0	2740	120
20	Malir Station	14.4	7.33	2.0	1.16	88.75	3.5	2.4	1200	80
21	Malir (New Era School)	14.7	8.20	6.2	3.59	150.00	1.5	1.1	120	80
22	Malir (Al-Mansoor Garden)	16.6	7.95	2.1	1.22	150.00	0.7	0.5	60	40
23	Malir (District Court)	14.3	8.24	4.5	2.61	147.50	0.8	0.6	100	110
24	Malir (Muhammadi Shool)	17.4	7.50	2.1	1.22	91.25	2.1	1.6	100	80
25	Malir (Prince Aly Academy)	14.8	7.25	1.2	0.69	71.25	10.1	7.2	1540	120
26	Malir (Paktel Tower)	13.6	7.89	5.0	2.90	141.25	1.5	1.1	60	80
27	Malir (Railway Police Chowki -1)	9.5	7.33	0.2	0.12	111.25	5.0	3.6	300	60
28	Malir Stream	16.2	7.32	1.8	1.04	141.25	1.7	1.2	110	200
29	Malir (Railway Police Chowki -2)	14.8	8.01	1.8	1.04	150.25	0.8	0.6	90	90
30	Quaidabad Chowrangi (Gulistan Cricket Club)	18.7	7.37	5.5	3.19	110.00	2.9	1.2	160	140

ISSN 2229-5518

Abbreviation Used:

OM = Organic MATTER TOC = Total Organic Carbon S = Sulfur
EC = Electrical Conductivity, TDS= Total Dissolved Salts

Table 3. Mean IVI of species occurred as a leading first dominant in polluted areas near the railway track and Shahrah-e-Faisal of Karachi.

No. of stands	Species	Pj	Tt	Af	Cc	Eh	St	Ct	Ta	Fi	Sp	Ca
8	*Prosopis juliflora*	53.77	25.02	20.71	41.58	17.5	10.67	15.1	-	20.92	20.9	-
6	*Tribulus terrestris*	19.80	63.64	27.82	-	30.19	17.68	17.12	18.35	23.53	-	-
2	*Abutilon fruticosum*	24.95	7.72	19.63	65.08	13..05	15.47	-	-	15.7	8.42	17.67
5	*Cressa cretica*	12.88	45.54	63.72	27.33	33.11	19.89	11.31	-	-	7.84	-
1	*Euphorbia hirta*	17.45	11.02	27.3	-	56.9	42.26	-	-	-	-	-
2	*Sida tiagii*	22.25	30.47	29.51	-	37.2	46.14	-	12.45	-	-	-
1	*Corchorus triloculari*	17.05	46.02	19.17	-	35.4	-	53.43	9.64	-	-	-
1	*Trichodesma amplexicaule*	16.11	24.36	14.92	27.51	-	-	-	35.96	14.56	-	-
1	*Fagonia indica*	31.88	31.17	-	32.36	-	-	-	-	47.55	-	-
1	*Salvadora persica*	32.96	6.97	24.46	-	-	-	16.45	39.29	-	48.02	5.08
1	*Convolvulus arvensis*	48.59	-	14.22	8.64	-	7.04	21.67	10.28	-	5.57	71.69

Symbol used:

Pj: *Prosopis juliflora* Tt:: *Tribulus terrestris* Af: *Abutilon fruticosum*
Cc: *Cressa cretica* Eh: *Euphorbia hirta* St: *Sida tiagii*
Ct: *Corchorus trilocularis* Ta: *Trichodesma amplexicaule* Fi: *Fagonia indica*
Sp: *Salvadora persica* Ca: *Convolvulus arvensis*