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Comparative soil analysis of riverside soil and artificial wetland soil created in Moradabad district

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Abstract
Moradabad city is one of the most populous city of Uttar Pradesh and also one of the largest producing and exporting centre of brasswares in India. The rapid development in recent decades has an adverse impact on the quality of groundwater. Keeping in view the frequent degradation of water quality, the present study has been done to decipher the chemical variations in soil profile by various natural and anthropogenic factors to assess the suitability of soil.

Keywords: Soil moisture, nutrients, industry, profile

Introduction
Moradabad is a major industrial city and is famous for its huge export of brass handicrafts and is also called ‘‘Brass City’’. Moradabad city in several years has undergone rapid industrial development. There were 82 registered units in the district in year 2000 and this figure has increased to 5487 in 11 years i.e. from 2001 to 2011 (DIC, Moradabad). There are about 600 export units and 5000 industries in Moradabad district [1, 2].
The area falls in the sub-tropical region and the climate is classified as tropical to sub-tropical type. The climate is characterized by a hot summer and bracing cold winter associated with general dryness, except during the south west monsoon when humidity is high. The rainy season extends from end of June to September or part of October. About 86% of rainfall takes place from June to September. During monsoon surplus water is available for deep percolation to groundwater. The average annual rainfall is 967 mm [4-6]. The study area forms a part of Central Ganga Plain and is underlain by alluvial deposits of Quaternary age. This alluvium is a pile of unconsolidated sediments made up of sequence of clay, silt, calcareous nodules, locally known as Kankar and different grades of sand and occurrence of gravel at depth is also occasionally reported. Calcareous nodules, indicative of sedimentation gaps, occur as thin beds and lenses [7, 8].

Material and Methods
For the determination of soil profile along the wetland formed in Moradabad due to Gangan and Ramganga river which were basically heart of the industrial city. We chose one spot as A as wetland of Gangan region B as wetland of Ramganga river and C as an artificial wetland (Taal) created.
Ten to twenty sample plots were taken in each category of wetland. Three replicate soil profile samples were collected randomly in each plot. Soil samples of 0-50 cm soil depth were collected using a stainless-steel slide hammer with an inner diameter of 3.5 cm on September 7th, 2012. Each collected sample in the soil profile was sectioned at 10 cm intervals in the field, and then stored in polyethylene plastic bags after air dried. Soil samples were ground using a mortar and pestle, and then sieved before laboratory analysis.
Total carbon (TC) and total nitrogen (TN) contents were measured with an elemental analyzer of vario MACRO cube (Germany, 2009). The methods which were developed by Murphy and Riley (1962) were used for the colorimetric determination of orthophosphate concentration in solutions. The perchloric acid ($HClO_4$) digestion method (Olsen and Sommers, 1982) was used to determine the total phosphorus (TP) in soil. The soil total C, N and P concentrations (mg kg^{-1}) were transformed to a unit of mmol kg^{-1}, and C:N, C:P and N:P ratios for each type of soil were calculated as molar ratios (atomic ratio), rather than mass ratios [9].

Observation and Result

Table 1: Basic soil characteristics.

Sample area	pH	EC (ms cm^{-1})	Salinity (%)	TC (%)	TN (mg kg^{-1})	TP (mg kg^{-1})
A	8.56	4.12	6.01	0.87	385.52	523.9
B	8.78	5.36	12.74	1.48	489.20	531.4
C	8.12	1.02	2.59	1.32	494.85	558.6

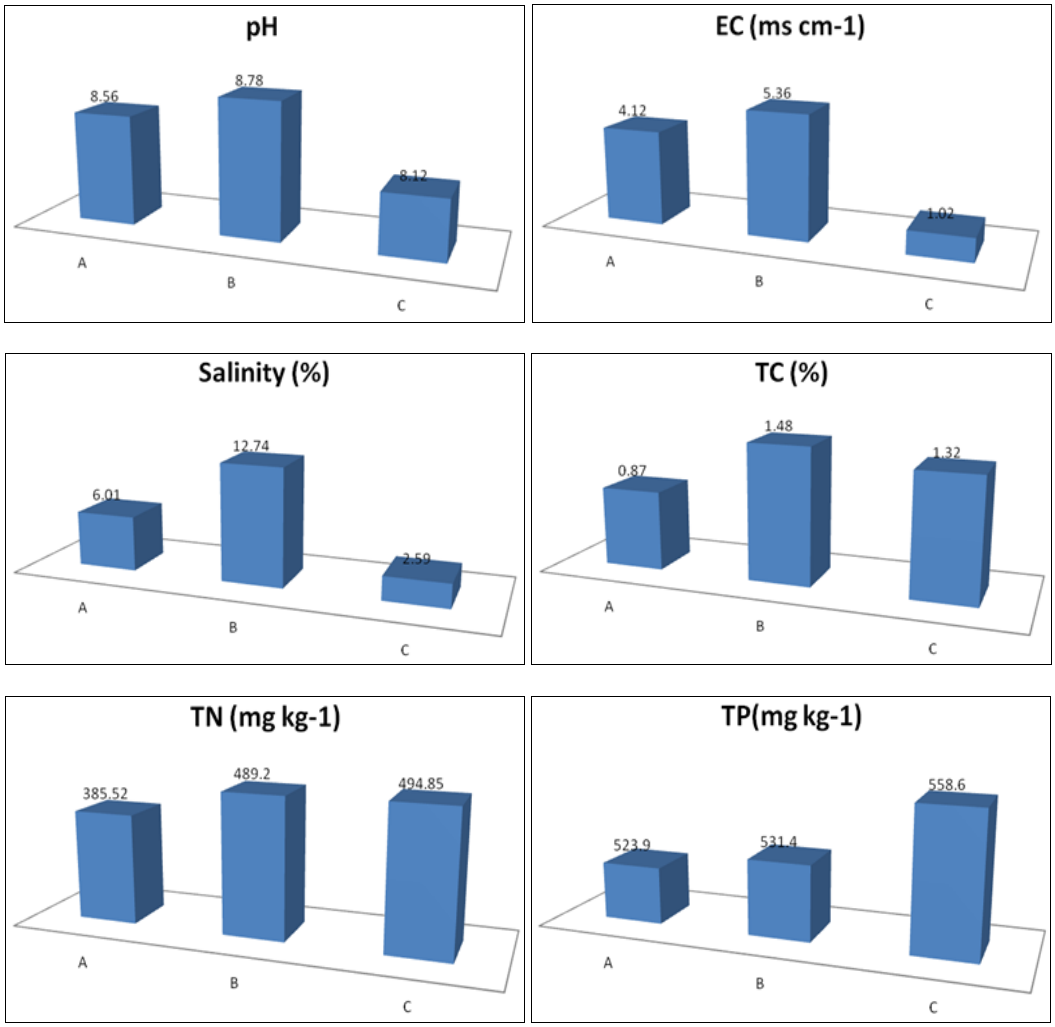

Fig 1: Basic soil characteristics

Conclusion

The high pH values of ~8.5 (classification: pH N 8.5 strongly alkaline) were observed in the three categories of wetland soil profiles in the study (Table 1). Generally, the soil pH in natural wetlands generally ranged from around 6.5 to 7.5 (with a few exceptions). Our results indicated that the unusually high pH values compared to those of wetlands could be caused by the regional geological, geochemical, and hydrologic conditions, as well as the land–river interaction in this region. The mean content of salinity was ranked as Spot B (mean, 12.74%) N Spot A (mean, 6.10%) N Spot C (mean, 2.52%), primarily due to the influence of cultivation which reduced soil salt content. The soil TC, TN and TP in B and C soils averaged 14.7 g kg^{-1}, 485.8 mg kg^{-1}, 531.5 mg kg^{-1} and 13.7 g kg^{-1}, 495.4 mg kg^{-1}, 559.4 mg kg^{-1}, respectively (Table 1), with no significant differences in each other. Though the mean content of TP was ranked as Spot C (mean, 559.4 mg kg^{-1}) N Spot B (mean, 531.5 mg kg^{-1}) N Spot A (mean, 523.9 mg kg^{-1}), the differences of TP among Spot A, Spot B and Spot C were not significant, which provided a platform to do C:N:P stoichiometry.

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