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Spectro-chemical study of Thiru. Aruran Sugar factory waste affected soil in A Sithoor, Cuddalore District, Tamilnadu, India

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ABSTRACT

The results obtained from the physico-chemical analysis of soil samples are presented in this paper. The estimated pH, EC, texture, calcium carbonate and available N, P, K values are tabulated and briefly discussed. An attempt is made to find the suitability of the ground water for irrigated and drinking purpose by comparing the results with the standard limits given by standards.

Key words: Soil pollution, pH, EC, Thiru. Aruran Sugar Factory.

INTRODUCTION

The green fields, trees, shurbs, ponds, lakes, tanks, rivers, forests, blue sky and the various systems existing in the nature, all constitute the so called environment. Environment creates favourable conditions for the existence and development of creatures. The lands is used for meeting the food and raw material supplies while water is used for drinking, irrigation and power etc.,

The degradation of environment by the pollution of water, soil, and air has become a major problem. Now-a-days water, soil and air are being polluted by many causes. Pollution has assumed a problem of international dimension and much talked subject today.

Microbial pollution of soil around slurry storage lagoons at a pigform was carried out by Petkov *et al*., (2006). Anna M. Stefanowicz *et al*., had studied the pollution – induced tolerance of soil bacterial communities in meadow and forest ecosystem polluted with heavy metals [2009]. An

ecological and ecotoxicological study of polluted wasteland plant communities in a former coke-factory located in Homecourt (France) was described by Marc Dazy *et al*., (2009).

A case study on the chemical composition and correlation to automobile traffic of the roadside soil of Jeddah city, Saudi Arabia was given by Mohammed W. Kadi (2009). Psychosocial health of residents exposed to soil pollution in a Flemigh neighbourhood was discussed by Frederiu Vendermoere (2008). Valeria Labhd *et al*., (2007) have studied the effect of hydro carbon pollution on the microbial properties of a sandy and a clay soil. Effects of heavy metals pollution of highway origin on soil nematode guides in north Shengang, China was given by Han Dechang *et al*., (2009).

Assessment of heavy metal pollution in surface soils of urban parks in Beijing, China was done by Tong-Bin Chen *et al*., (2005). Krishtian K. Brandt *et al*., (2010) have discussed about the development of pollution-induced community tolerance is linked to structured and functional resilience of a soil bacterial community following a five year field exposure to copper. Copper content in animal manures and potential risk of soil copper pollution with animal manure use in agriculture was carried out by Xiong Xiong *et al*., (2010). A novel approach for soil contaimnation assessment from heavy metal pollution was given by Xiaoqing Dong *et al*.,(2010).

2. Legend of samples

The area in which the soil samples are collected for our research work is nearer to Thiru. Aruran Sugar factory, A. Sithoor, Cuddalore District. The location of A. Sithoor in Cuddalore district is given in Fig. 1.

The location of five different sampling stations are given in Fig. 2, the sampling locations are,

i. Sampling station – 1 (S_1)

The soil sample was collected at the place of Thiru Aruran sugar factory.

ii. Sampling station – 2 (S_2)

It is located at a distance of ¼ km in the North-west side from the Thiru Aruran Sugar factory.

iii. Sampling station – 3 (S_3)

It is located at a distance of ½ km in the North-west side from the Thiru Aruran sugar factory.

iv. Sampling station – 4 (S_4)

It is located at a distance of ¾ km in the North-west side of the sugar factory.

v. Sampling station – 5 (S_5)

It is located at a distance of 1 km in the North-west side of the sugar factory.

All the soil samples were collected in the cleaned, air tight polythene bags and taken to the laboratory for analysis.

RESULTS AND DISCUSSION

3.1 Physico – Chemical Parameters for the Soil Samples

The calculated physico – chemical parameters for our soil samples collected from 5 sampling stations are given in tables 1 and 2.

3.1.1. pH

The pH value is measured for all locations (S_1 to S_5) and its values ranges from 6.7 to 7.6. The locations S_3 and S_5 records the maximum values 7.6 and the location S_4 records the minimum values 6.7.

Patil *et al*., (1991) recorded pH values 6.6 for a control soil they had chosen. Soil pH is an important consideration for farmers and gardeners for several reasons, including the fact that many plants and soil life forms prefer either alkaline or acidic conditions that some diseases tend to thrive when the soil is alkaline or acidic, and that the pH can affect the availability of nutrients in the soil. Many plant diseases are caused or excerbated by extremes of pH, sometimes because this makes essential nutrients unavailable to crops or because, the soil itself is unhealthy. For example, chlorosis of leaf vegetables and potato scab occur in overlay alkaline conditions, and acidic soils can cause clubroot in brassicas. The variation of pH with the sampling stations is given in Fig. 3.

3.1.2. Electrical conductivity (EC)

The EC value is measured for all location (S_1 to S_5) and its value ranges from 0.06 dsm^{-1} to 0.20 d sm^{-1}. The location S_5 records maximum values 0.20 dsm^{-1} and the location S_4 records minimum value 0.06 dsm^{-1}. Singaravel *et al*., (2000) recorded EC value 0.5 dsm^{-1} for a good soil they had chosen. All of our soil samples have the EC values with in the prescribed limit. EC values within the 250 μM bos/cm is considered suitable for irrigation 1988.

When EC values exceed this recommended values, the germination of almost all crops would be seriously affected resulting much reduced yield. That the EC values exceeded the recommended values which may affect the growth of crop. The variation of EC with the sampling station is given in fig. 4.

3.1.3. Textures:

The soil samples S_1 and S_2 are clay in nature, S_3 and S_5 are slightly clay in nature.

3.1.4. Calcium carbonate

The calcium carbonate value is only in sampling stations S_5 and all other sampling station S_1 S_2, S_3 and S_4 have no calcium carbonate.

3.2. Available N, P, K

The available N, P, K in the collected soil samples are given in Table 2

3.2.1. Available nitrogen (N)

The available nitrogen is measured for all location (S_1 to S_5) and its value ranges from 49 kgs /ha to 77 kg /ha. The location S_5 records maximum values 77 kgs/ha and the location S_4 records

minimum values 49 kg/ha. Singarvel *et al*., (2000) recorded the available nitrogen value is 365 kg/ha for a good soil they had chosen. Our soil samples contain only minimum nitrogen. The variation of nitrogen with the sampling station is given in Fig. 5.

3.2.2. Available phosphorus (P)

The available phosphorus is recorded in all locations (S_1 to S_5). Almost all the sampling stations have the same value except S_1 and S_2. Singaravel *et al*., (2000) recorded the available phosphorus values as 17 kg/ha for a good soil they had chosen. Variation of P with the sampling station is given in Fig. 6.

3.2.3. Available potassium (K)

This element is found in all locations (S_1 to S_5). The sampling station S_1 has 75 Kg/ha, S_2 has 25 kg/ha, S_3 and S_4 have 20 kg/ha and S_5 has 125 kg/ha. Kudesia *et al*., (1997) recorded 1.36% for a good soil they had chosen. Murali *et al*., (2003) recorded 0.053% for control soil they had chosen. The variation of K with the sampling station is given in Fig. 7.

Table 1Physico-Chemical Parameters for Soil Samples

Characteristic Parameters	S_1	S_2	S_3	S_4	S_5	Patil et. al. (1991)	Sinagarvel et. al., (2000)
pH	7.4	7.5	7.6	6.7	7.6	6.6	-
EC	0.15	0.12	0.11	0.06	0.20	-	0.5 (dsm^{-1})
Texture	CL	CL	SCL	Sandy	SCL	-	
Calcium Carbonate	N	N	N	N	P	-	

CL - *Clay*
SCL - *Slightly clay*
N - *Nil*
P - *Present*

Table 2 Available N, P, K in the Soil Samples

Characteristic Parameters	S_1	S_2	S_3	S_4	S_5	Sinagarvel et al (2000)
N	67	65	57	49	77	365 kg/ha
P	43	44.5	49	49	49	17 kg/ha
K	75	25	**20**	**20**	**125**	**199 kg/ha**

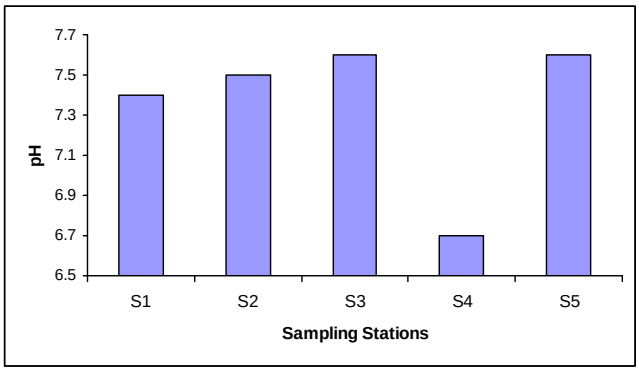

Fig. 3 Variation of pH with sampling stations

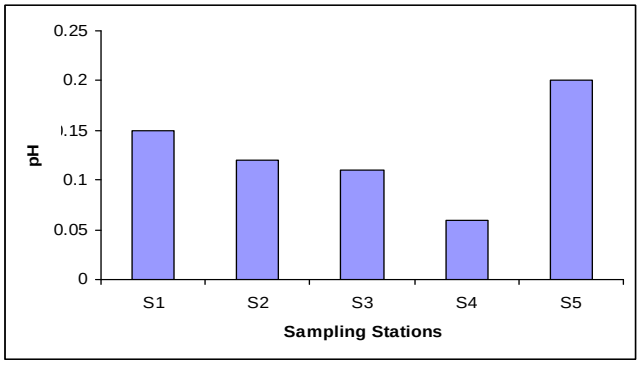

Fig. 4 Variation of EC (dSm^{-1}) with sampling stations

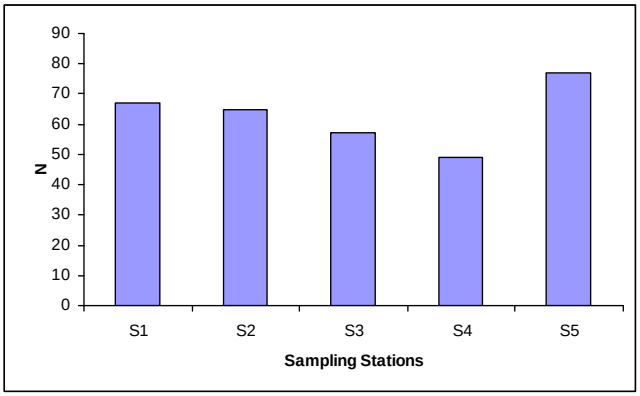

Fig. 5. Variation of N(Kg/ha) with sampling stations

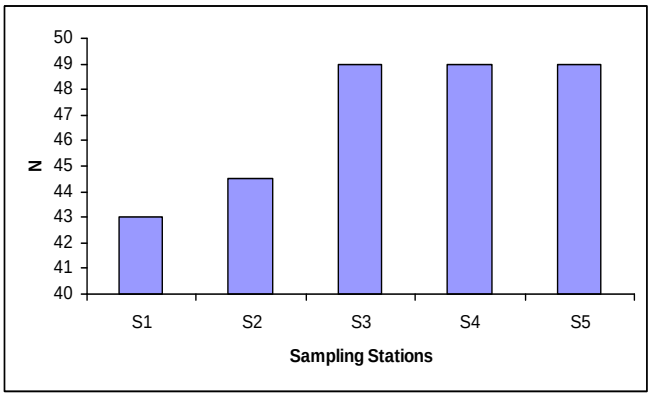

Fig. 6 Variation of P (Kg/ha) with sampling stations

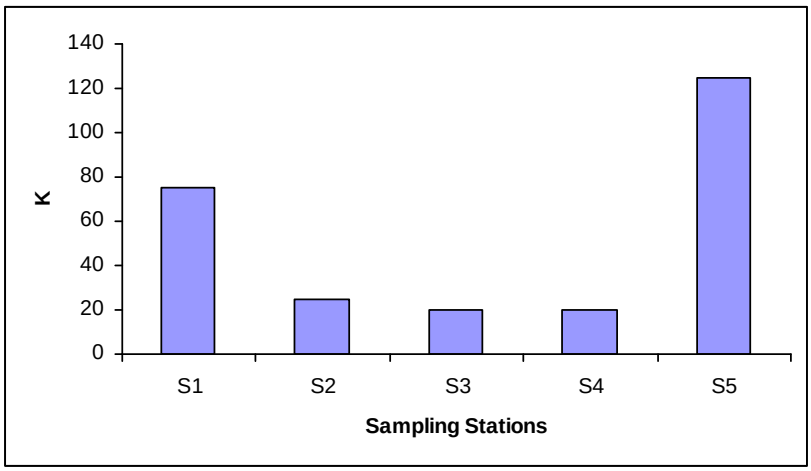

Fig. 7. Variation of K (Kg/ha) with sampling stations

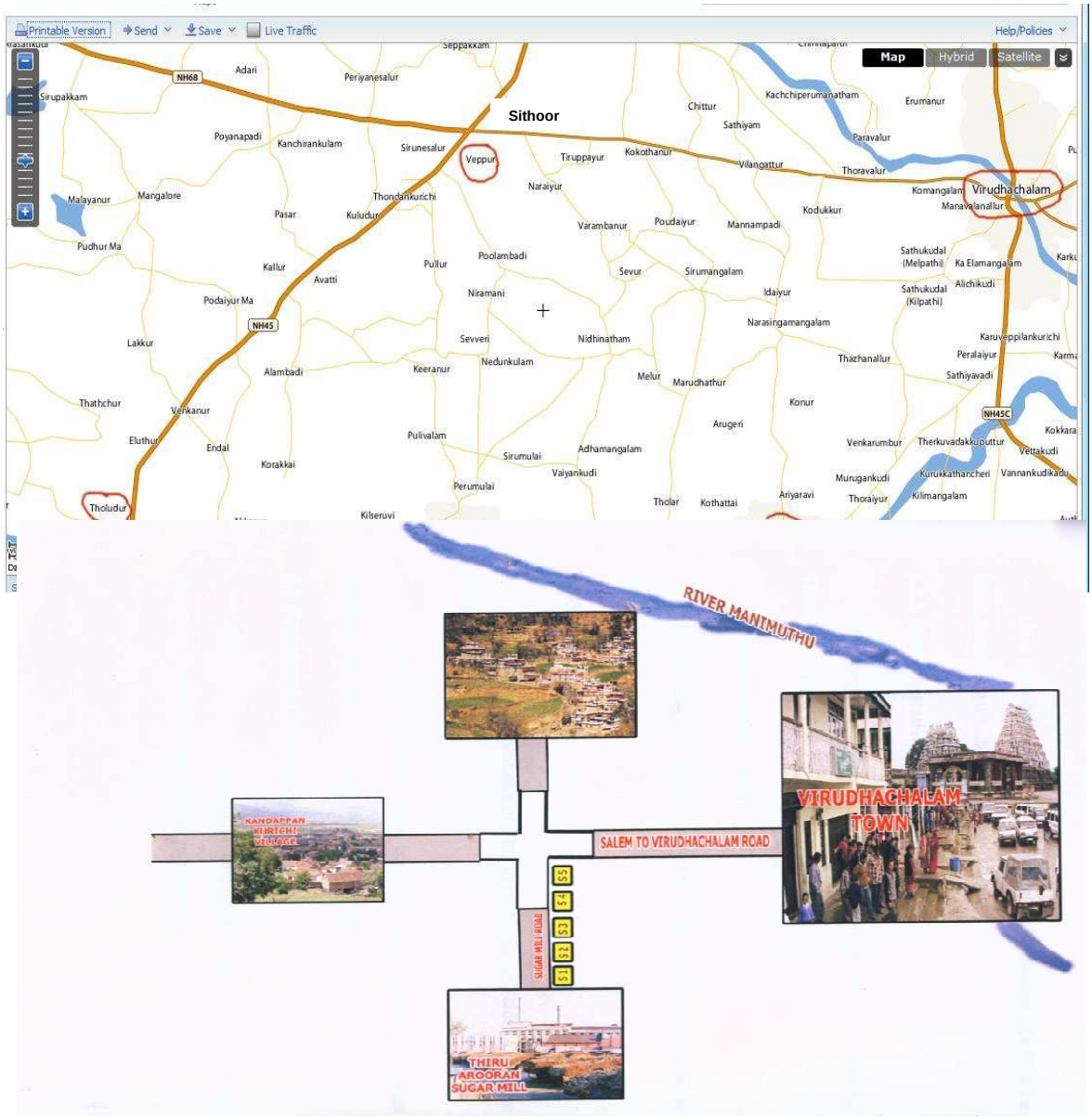

Fig.2. Sampling stations

CONCLUSION

From the spectro-chemical study of Thiru Aruran Sugar factory waste affected soil in A. Sithoor, Cuddalore district, the following observation are made:

1. The pH value is greater than 7 in the locations (S_1, S_2, S_3 and S_5) showing that soils of all locations have become alkaline due to the Sugar factory waste. 2. The EC in the locations S_1, S_2, S_3, S_4 and S_5 are all lesser than the safety value (0.5 dsm^{-1}) which infers that there are more dissolvable salts in the soil solution than the prescribed limit. 3. The available nitrogen (N) is also less than that for a good soil (365 leg/ha) which infers that the soil is nitrogen deficient and unfit for vegetative

growth. 4. The available phosphorus (P) and Pottassium (K) are very much higher in all locations. 5. The texture of soil samples S_1 and S_2 are clay in nature, S_3 and S_4 are sandy in nature. 6. The calcium carbonate value is present only in sampling station S_5 and all other sampling station S_1, S_2 S_3 and S_4 have no calcium carbonate.

Hence it is recommended that water must be thoroughly analysed and studied before being used for domestic application.

REFERENCES

[1] Anna M. Stefanowicz., Maria Niklinska, and Ryszard Laskowski, **2009**, *European Journal of Soil Biology*, 45: 363-369.
[2] Frederiu Vandermoere, **2008**, *Social Science and Medicine*, 66: 1646-1657.
[3] Han Dechang, Zhang Xiaoke, Tomar Vijay Vikram Singh, Liqi., Wen Dazhong and Liang Wenju, **2009**, *Journal of environmental Sciences*, 21: 193-198.
[4] Kristian K. Brandt., Rasmus. J.N. Frandsen, Peter E. Holm and Ole Nybroe, **2010**, *soil biology & Biochemistry*, 42: 748-757.
[5] Kudesia V.P., and Fetly U.K., **1997**, "A text book of environmental and Biochemistry" Prakashan (P) Ltd.
[6] Marc Dazy, Eric Beraud, Sylvic Cotelle, Frederique Grevilliot, Jean – Francois Ferard and Jean – Francois Masfaraud, **2009**, *chemospherc* 77: 376-383.
[7] Mohammad W. Kadi, **2009**, *Journal of Hazardous materials*, 168: 1280-1283.
[8] Murali. M., and Mithun Raj **(2003)**, *Indian J. Environmental Protection* 23 (9).
[9] Patil. A.D., *et al*., **1991**. *Indian J. Environmental Health*, 33(1): 59-65.
[10] Petkov. G.S., Kostadinova. G.S., Dener, S.A., Mihaylova, G.S., and Pavlov, D.C., **2006**, *Applied Soil ecology*, 34: 10-18.
[11] Singaravel. R. and Govindamsamy. R., **2000**, "Practical manual for soil fertility, fertilizers and manures.
[12] Tong-Bin Chen., Yuan – Ming Zheng, Mei Lei, Ze-Chun Huang, Hong-Taowu., Huang Chen., Ke-Ke Fan., Ke Yu., Xiao Wu., and Qin-Zheng Tian, **2005**, *Chemosphere*, 60: 542-551.
[13] Valeria Labhud, Carlos Garcia and Teresa Hernandez, **2007**, *Chemosphere*, 66: 1863-71.
[14] Xiaoqing Dong., Chaolin Li, JiLi, Jiaxin Wang, Suting Liu and Bin Ye., **2010,** *Journal of Hazardous Materials*, 175: 1022-1030.
[15] Xiong Xiong., Liyanxia., Liwei., Linchunye, Han Wei and Yang Ming, **2010**, *Resources, conservation and recycling*, 54: 985-990.