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Physico-chemical characteristics of soil & Insilco Ltd. factory effluent and its effect on germination in vegetable crops *viz* tomato, brinjal and lady finger

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The effluent of Insilco Ltd. Factory on growth parameters i.e. seed germination and seedling growth of selected vegetable crops *viz*. Tomato, Brinjal and Lady finger found to be dependent on concentration. Level of 25% and 50% of the factory effluent indicated a stimulatory effect on all-the vegetable crops, whereas 100% level showed a deleterious effect. This may be attributed to the presence of some toxic inorganic and organic matter in effluent, which may causes inhibition in the growth. Among the crops Tomato recorded the highest enhancement in seed germination, shoot length and Lady Finger showed the maximum value of root length at, lower concentration.

Keywords: effluent, germination, vegetables, soil, seedling

Introduction

In our country irrigation of crop with industrial and municipal wastewater is a common practice. The usage of water can be divided into three categories i.e. domestic consumption, commercial usage and irrigation in agriculture. Only 3% of the total water on the earth surface is fresh water and even of this amount only a small % age is available. The effluent from Insilco Ltd. is located in Gajraula (65 km west Moradabad) UPSIDC industrial area Bhartiagram Gajraula Jotiba-Phule Nagar (U.P.) India is disposed of through several drains which carry their pollution load in to river that ultimately causes pollution. Factory manufacturing spray dried silica in different grades for rubber and various non-rubber applications. Unit is spread in 67 acres.

The deleterious effect of industrial effluent on growth and productivity of various crops have been observed by various workers ^[1, 3]. No effort have been made to study the water pollution caused by Insilco Ltd. factory, Gajraula and its irrigation impact on germination and early seedling growth of some vegetable crops *viz*. Tomato, Brinjal and Lady finger.

Material & Methods

The effluent from Insilco Ltd. Factory was collected from its disposal point at weekly intervals and was physico-chemical analysis according to APHA ^[4]. Seeds of Tomato, Brinjal and Lady Finger were kept in petri-dishes lined with effluent moistened filter paper of different concentration 25%, 50% and 100% v/v and appropriate amount of Ca. A control set with distilled water was also set. The seed germination and seedling growth were recorded daily at fixed time and the emergence of radical and plumule was considered as criterion for germination. Physico-chemical characteristics of soil are presented in table-I and those of the effluent of main outlet of Insilco factory were analyzed by a standard procedure ^[4, 5]. Table-II.

Result and Discussion

The physico-chemical characteristics of the soil are presented in table (1 and 2). Result showed that there was low concentration of major inorganic nutrients in the effluent as reported by several workers ^[6-8]. Data (table 1 & 11) revealed that colour, pH, transparency, TDS, TSS, BOD, COD, Total-N, micro & macro nutrients E_{ce}, Total hardness and free CO₂ are not with in the permissible limit of irrigational water as prescribed by ISI:3306-1974. Therefore, the effluent of Insilco Ltd. factory as such is considered unsuitable for irrigational purposes.

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Table 1: Physico-chemical analysis of soil

pH	-	7.8
Clay (%)	-	17.89
Fine sand (%)	-	32.46
Coarsae sand (%)	-	46.26
ECe (m Scm ⁻¹)	-	0.08
Water Holding capacity %	-	50.26
Available Nitrogen (kg/ hat)	-	194
Available Phosphorus (kg/ hat)	-	19.20
Available Potassium (kg/ hat)	-	27.16
Bulk density (g/ml)	-	3.14
Organic Carbon %	-	0.56
Silt %	-	7.46

Table 2: Physico-chemical analysis of effluent Insilco Ltd. Factory, Gajaraula Jyotiba Phule nagar (U.P.) India.

S. No.	Physico-chemical Parameters	Inlet Sample (Et. P.)					Outlet Sample (Et. P.)				
		1	2	3	4	5	1	2	3	4	5
1.	Colour	Brown	Dark Brown	Light gray	Brown	Brown	Light brown	brown	brown	brown	Black brown
2.	pH	5.6	4.7	7.6	5.1	4.9	7.6	7.7	6.5	7.8	7.8
3.	Transparency (cm)	2.0	1.9	4.7	2.4	1.9	4.2	4.5	3.2	4.6	4.7
4.	TDS	1765	1640	1420	1314	1224	1320	1516	1122	1326	1402
5.	TSS	150	147	167	128	120	135	167	172	135	142
6.	DO	1.7	2.4	13.0	10.2	11.1	8.3	7.2	8.1	12.0	11.5
7.	BOD	31.4	65.6	112.6	450	912	146	142	816	724	512
8.	COD	415	613	250	426	317	726	418	625	711	210
9.	Total-N	10.2	14.3	24.0	12.6	24.2	16.0	18.6	27.2	48.1	160
10.	Ca	62	48	56	72	81	47	42	80	78	40
11.	Mg	40.3	37.2	39	46	51	36	33	50	47	32
12.	Na	11.1	18.2	13.6	17.1	10.4	8.6	12.3	11.6	17.1	20.0
13.	K	16.1	14.2	13.2	17.0	12.0	12.4	17.6	13.1	12.0	19.0
14.	ECe (mScm ⁻¹)	2.6	2.8	3.4	3.9	2.7	3.0	2.7	2.1	3.2	2.8
15.	Total Hardness (as CaCO ₃)	30.2	140.2	320	490	512	68.1	198	246	502	409
16.	Free CO ₂	56	72	150	210	417	84	196	304	412	819
17.	Cl as (NaCl)	442	976	1150	1101	872	1104	1224	1363	412	819
18.	Oil and grease	19	52	72	14	70	89	71	54	64	24
19.	Chloroform extractable (mg/L)	250	316	342	250	176	302	254	186	70	96
20.	PO ₄	7.4	3.7	8.6	20.4	19.6	13.1	6.2	9.4	60	17
21.	SO ₄	110.1	112	108	126	122	142	101	122	116	128

Table 3: Effect of Insilco Ltd factory effluent on germination and seedling growth of some crops viz. Tomato, Brinjal and Lady finger

% Germination		Seedling length (Cm)										
		Root length							Shoot length			
Crop	Control	25%	50%	100%	Control	25%	50%	100%	Control	25%	50%	100%
Tomato	90	92	95	68	2.8	2.46	3.10	1.76	2.20	2.30	2.60	1.10
Brinjal	89	97	100	80	3.30	3.60	4.80	2.83	3.50	3.68	6.80	3.01
Lady Finger	90	94	97	70	3.70	4.03	5.10	2.31	2.40	2.48	3.36	1.62

Various concentrations of Insilco Ltd. factory effluent markedly affected the germination and seedling growth in the crops studied table III. However the seeds while exposed to effluents, exhibited differential responses. Interestingly lower concentration of effluent 25% and 50% v/v stimulated the germination, root and shoot lengths. Among crops, maximum enhancements in germination root and shoot lengths were recorded in Brinjal while minimum in Tomato conversely raw effluent 100% v/v proved consistently deleterious to the germination, root and shoot length in crop studied.

In general, the sequence of crops to various effluent solution observed was Brinjal > Lady finger > Tomato in descending order of their tolerance [9-10]. In view of above results it seems probable that chemical and oil present in abundance in effluent disturbing the iso-osmotic relations in rhizosphere of the plants induced obstructions in the absorption of water [11]. Never the less, the trace amount of these chemicals might be beneficial to these parameters as observed in experiment. Thus it is concluded that effluent of Insilco Ltd. factory after proper dilution can be used for irrigation purposes in Brinjal field.

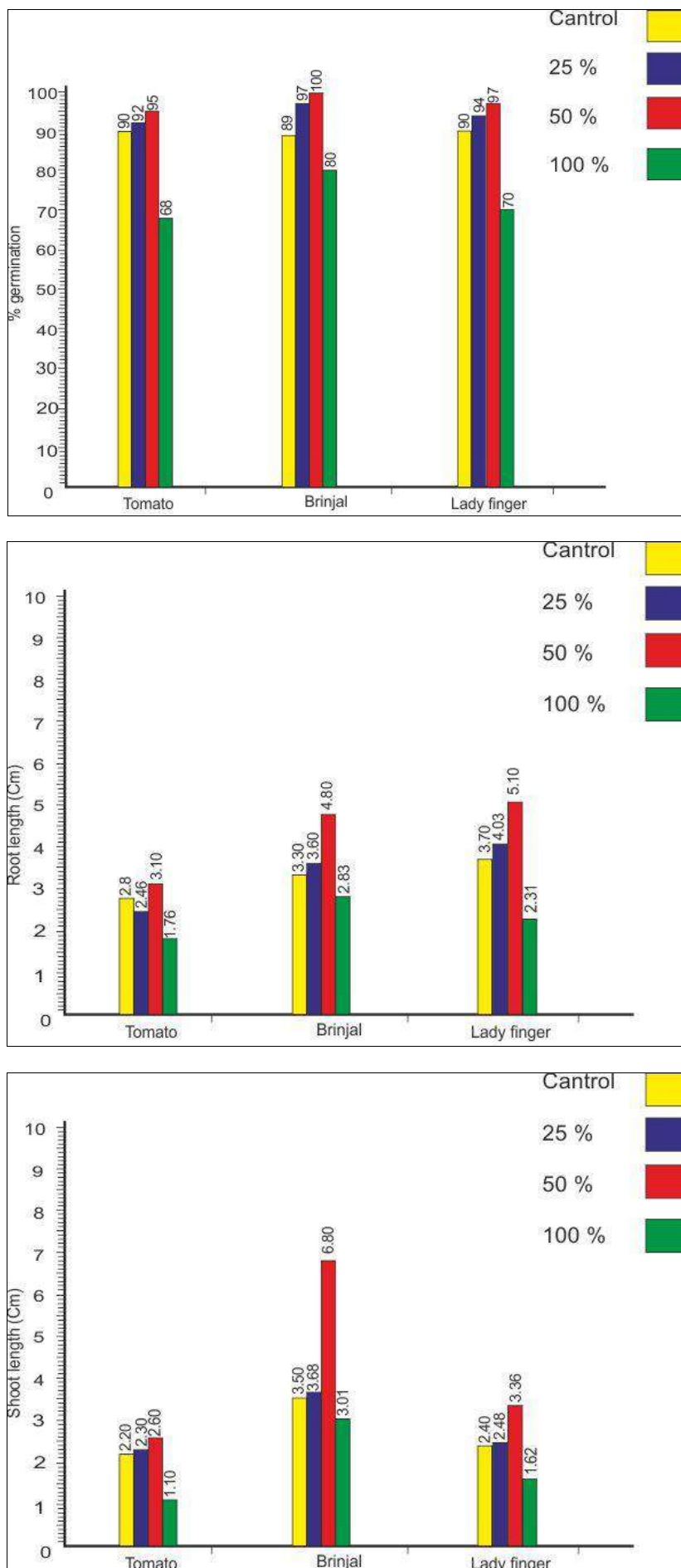


Fig 1: Crops

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References

1. Sahai R Neelam. Effect of fertilizer factory and distillery effluents on the seed germination of legumes. Bull. Pure & Appl. Sci. 1987;4:12-15.
2. Gomathe V, Oblisami C. Effect of pulp and paper mill effluent on germination of two crops, Ind. J Envir. Helth. 1992;34:326-328.
3. Mohan, Mukesh Baboo, Jain V. Chemical composition of rubber factory effluent and its effect on seed germination and growth of some rabi crops wheat, Barley and gram, J. Ind. Counl. Chemist. 1998;15(1& 2):44-47.
4. APHA. Standard methods for the examination of water and wastewater analysis, Washington DC; c1980.
5. Piper CS. Soil and plant analysis. A laboratory manual of methods of examination of soil and the determination of inorganic constituents of plants. Among from waste Agri. Res. Industries Univ. Aldelaide, Aldelaide; c1966.
6. Sahare D. Long terms impact of industrial effluent on agriculture soil, Rec. Res. Sci. Tech. 2014;6(1):253-257.
7. Mukesh Baboo, Mohan A. Chemical composition of rubber factory effluent and its effect on growth of two cultivars of pea (*Pisum sativum*), J Ind. Council. Chemist. 1999;15(1):9-12.
8. Mukesh Baboo, Mohan A. Effect of WIMCO, ITR and CAMPHOR factories effluent on growth parameters of some rabi crops, Acta. ciencia India. c2000;xxvic(i):001.
9. Pandey S, Tyagi P, Gupta A. Physico-chemical analysis and effect of distillery effluent on seed germination of wheat and lady finger, ARPJ, J Agri. & Biolog. Sci. 2007;2:35-40.
10. Mukesh Baboo. Ecology of the effluent channel flowing from distillery factory and its irrigational impact on seed germination and seedling growth of some rabi crops, Int. J Adv. Appl. Res. (IJAAR). 2015;3(01-09):77-84.
11. Work Anteneh, Sahu OP. Effect of sugar industry wastewater on rural agriculture crops. The J Agri. & Natural Res., Sci. 2014;1(3):151-157.