Jr. of Industrial Pollution Control 26 (1)(2010) pp 121-123

IMPACT OF EFFLUENT OF BETUL SOYA SOLVENT EXTRACTION PLANT ON ENVIRONMENT

J.K. WAHANE, K.R. MAGARDHE AND O.N.CHOUBEY*

Department of Chemistry, Govt. Narmada P.G.College, Hoshangabad M.P. 461001, India

Key words : DO, BOD, COD, Fluoride, Phosphate, Hardness, Alkalinity, pH, Extraction, ETP

ABSTRACT

Impact of Soya solvent extraction plants on local groundwater of nearby industrial area of Betul district was studied. It was observed that the concentration of TDS, EC, Hardness, Chloride, Phosphate, BOD, COD, were higher in the groundwater samples.

INTRODUCTION

Soyabean is world's one of the most useful and cheapest source of protein. The botanical name of Soyabean is *Glycine max*. M.P. has emerged as the Soya state in India. Major portion of Soyabean is cultivated in M.P as compared with overall production in India. There are a number of Soya solvent extraction plants in the state. The composition of soybean constituent are moisture (11% Max) protein (48% min), fat (1.57% Max) Fiber (6.5% Max) sand/ silica (2% max) Urease (.30% Max). In this paper the adverse impact of chemicals used and discharged through ETP in Soya Industry on local groundwater has been studied.

MATERIALS AND METHODS

Oil extraction process

Soyabean is mainly used for Soya oil and vanaspati as cooking oil. The steps used for oil extraction are cleaning, cracking, cooping. Seeds are heated through jacked steam and open steam to soften the seeds. The seeds are flaked between two rollers then flakes are dried using hot air. The dried flakes are sent to extractor and Hexane is sprayed on material to extract oil. The hexane condensed out and recycled to the process. The crude oil extraction is heated up to 50^{o}C to 60 ^{o}C . Water and phosphoric acid is added. To remove the phosphate, gum and free fatty acid from the oil. Caustic soda is used to neutralize it. The bleaching agent is used to remove colour. Lastly oil is then deodorized by heating at 220^{o}C in the above oil extraction process major chemicals used are hexane, phosphoric acid, bleaching agent and caustic solution. The effluent of the process is discharged in ETP for treatment and the treated effluent finally is used for irrigation or discharged which can affect the ground water quality.

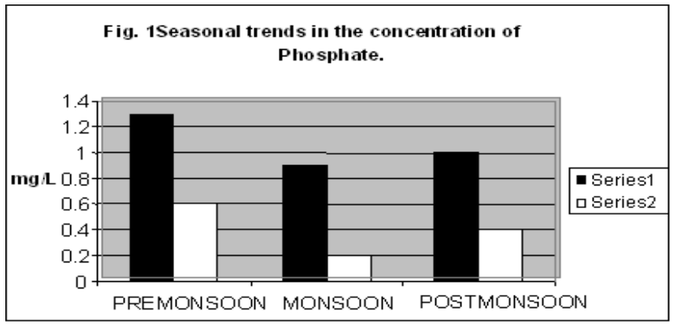
Sampling site and Analysis

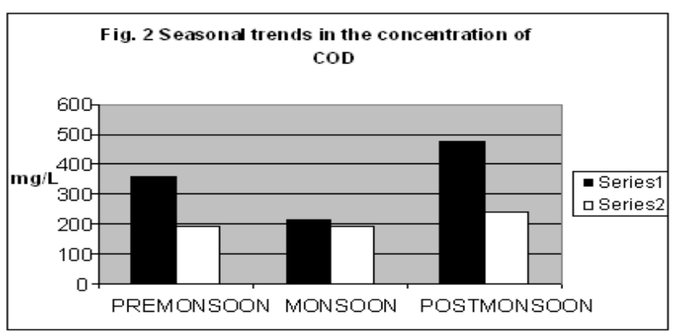
The samples were taken from in side and near by area of Betul Oil & Flour Mill throughout the year. APHA (1995) and Trivedy and Goel (1986) have been used for the analysis of ground water for pH, Electric

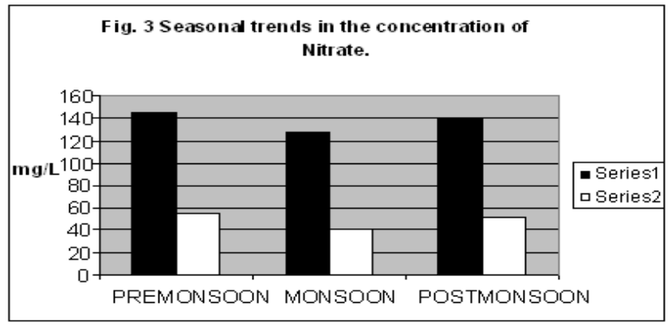
Address for correspondence : Email : omchoubey@yahoo.com

Table 1. Mean values of phyico-chemical parameters at sampling Sites of soya solvent extraction plantat dist. Betul

S.N	Parameter	Permissible Limits	Premonsoon		Monsoon		Postmonsoon	
1.	pH	6.5-9.2	6.3	7.1	6.8	6.7	6.5	7.5
2.	ECMhos/cm.	300	1480	830	1550	990	1999	1064
3.	T.D.S. mg/L	500	1080	680	1174	720	1999	610
4.	Total Alkalinity mg/L	600	330	580	280	500	836.2	192.7
5.	Total Hardness mg/L	600	410	720	160	624	1600	360
6.	Ca Hardness mg/L	200	90	510	40	465	160	280
7.	Mg Hardness mg/L	150	320	210	120	159	1440	80
8.	Chloride mg/L	1000	370	430	258	252	355	127.8
9.	Fluoride mg/L	1.5	0.9	0.7	0.83	0.87	1.08	0.56
10.	Phosphate mg/L	0.1	1.3	0.6	0.9	0.2	1.0	0.4
11.	Nitrate mg/L	45	145	55	128	40	140	51
12.	Sulphate mg/L	400	150	110	139.2	98.3	503	20.7
13.	Salinity mg/L		1.110	0.622	1.162	0.742	1.999	1.233
14.	Turbidity NTU	20	085	002	095	003	69	003
15.	DO mg/L	6	5.6	6.1	5.1	6.4	5.7	8.1
16.	BOD mg/L	6	128	45	77	62	112	65
17.	COD mg/L	10	360	190	208	190	480	240
18.	Zinc mg/L	1.5	0.210	0.330	0.196	0.200	0.260	0.230
19.	Copper mg/L	1.5	0.380	0.370	0.324	0.328	0.380	0.310
20.	Iron mg/L	0.3	1.110	0.320	1.020	0.226	1.110	0.190
21.	Manganese mg/L	0.05	0.620	0.030	0.541	0.010	0.680	0.070







conductance TDS, Turbidity, Alkalinity, Total Hardness, Calcium and Magnesium Hardness, Chloride, Fluoride, Nitrate, Sulphate, DO, BOD, COD and some Heavy metals like copper, Zinc, Iron and manganese.

RESULT AND DISCUSSION

pH of all water samples was found to range between 6.3 to 7.5. The samples collected from the Industrial area and inside the Soya plant were found acidic in nature. Electric conductance is a measure of water capacity to convey electric current. The specific conductance of all samples is above the permissible limit (300 mg/L) of WHO indicating the contamination of water through waste. High TDS value is responsible for high concentration of minerals. Concentration of TDS can also be estimated on the basis of electric conductivity measurement. Hardness of water increases due to presence of carbonate and bicarbonates ions in ground water. We observed high value of COD in all water samples throughout the year Fig. 2. BOD is also high in all water samples throughout the year. These values are much above n the limiting values indicating danger for domestic uses.

Chloride in drinking water is harmless if present below 250 ppm but its higher value at some stations causes harms to metallic pipes and crops Chloride value of all samples are above 250 ppm. Phosphate values of all samples are higher then permissible limit. Shown in Fig. 1. It is due to excess addition of phosphoric acid during oil extraction process of the plant. We observed the Nitrate value of some water samples are above the permissible limits Fig. 3 shows excess of Nitrates it is particularly dangerous to infants less than six month's causing child disease Methemoglbinaemia. During the analysis of heavy metals in the year 2007-2008 we observed the value of Cu & Zn, with in the permissible limit but the value of Fe & Mn. was above the permissible limit. When the value of Fe is increased in water their taste and odour can be changed.

Reasons for high value of these parameters are due to the accumulation of minerals, salts from the industrial waste water to the soil and leaching to the ground water.

REFERENCES

APHA 1995. *Standard Methods for examination of Water and Wastewater* APHA, USA.

Trivedy, R.K. and Goel, P.K. 1986. *Chemical and Biological Methods for Water Pollution Sudieds.* Environmental publication Karad India 2-31.

Bahane, J.K., Udaipuire, S.K and Choubey, O.N. 2007. Impact of effluent of soya solvent extractions plants in environment. *Jr.of Industrial Pollutions Control.* 23 (1) : 103-105

WHO 1984. *Guidelines of Drinking Water Quality.* Vol.1 Recommendation world Health Org. Geneva, P. 1 .

Symal, A. and Ghanekar, V.D. 1978. *Indian J.Chem.*16 A. 81.

Hasan, M.Z. and Pande, S.P. 1983. *J Indian Water Works Assoc.* 16 : 259.

Manivasakam, N. 2002. *Physico Chemical Examination of Water Sewage and Industrial Effluents.*Pragati Prakashan, P. 234.

Warhate, S.R., Yenkie, M.K.N., Chaudhari, M.D.and Pokale, W.K. 2006. Impact of mining activities on water and soil. *J.Environ Sci. and Engg.* 48 (2) : 81-90.

Journal of Industrial Pollution Control

INSTRUCTIONS TO AUTHORS

Manuscript on any of the topics pertaining to the scope of the journal shall be considered for publication.

No of Copies : Two copies of MSS typed in double space on A4 size bond paper alongwith a **CD** in **PM6.5 or MS word** should be sent to the editor .The authors are advised to to keep a complete copy with them. It is essential to provide contact telephone number and email of author.

TITLE : The title must be short and informative. Please also give one short and running title in CAPITAL LETTERS. The address(es) of authors(s) given immediately below the name should invariablr mention the location of the work including the city PIN code and country. Put and asterisk on the name, to whom all correspondence should be addressed.

KEY WORDS : The title should follow 3-7 Key-words.

TEXT : Text of paper should be divided into Introduction, Materials and Methods, Results, Discussion, Acknowledgement, References.

All Reviews ,theoretically oriented papers and short communications can be submitted in running Figures should be drawn on tracing paper or white art paper sheet using black India ink.Good computer generated figures are welcome. The legends must be compatible to the size of the figure. All figures and lettering associated with them must be capable of withstanding reduction by at least four times.

All photographs should be on glossy sheet.

All legends should be typed on separate sheet.

REFERENCES should be arranged alphabetically by author's surname in the following pattern:

Fills, J. and Swanson, W. R. 1975. The release of nutrients from river and lake sediments. *J. Wat. Poll Cont Fed* . 47 : 1032 - 41

Wetzel, R. G. 1975. *Limnology* W. B. Saunders and Company, Philadelphia. Ducan, N. and Rzoska, J. (ed) (1978) Land *use impacts on Lake and Reservoir Ecosystems.*

Proceeding of MBA Project 5 workshop (Poland) Facultas Verlgg, Wien.

Likens, G.E. 1972. *Eutrophication and aquatic ecosystems* p.3-13 In : *Nutrients and Eutrophication* (Ed by G.E. Likenes) Spac. Symp 1, Am Soc Limmol, Ocanogr Washington.

All mss should be submitted to- ENVIRO MEDIA, Post Box- 90, 1, Sheila Apartment, Behind Urban Bank, Rukmini Nagar Branch, KARAD- 415 110, INDIA
☎(91-2164- 220369; 020 27210103;
E-mail : str_rktem@sancharnet.in

REPRINTS

No graties reprints are given Nominal cost is charged for the reprints. Minimum number of reprints supplied is Fifty.