

## **IMPACT OF EFFLUENT OF SOYA SOLVENT EXTRACTION PLANTS ON ENVIRONMENT**

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### **ABSTRACT**

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**Impact of Soya solvent extraction plants on local groundwater of nearby industrial area of Betul, Indore and Dewas district was studied. The concentration of TDS, hardness, chlorides and sulphate were higher in the groundwater samples. High soil alkalinity was observed in the surrounding area.**

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### **INTRODUCTION**

Soyabean is world's one of the most useful and cheapest source of protein. The botanical name of Soyabean is *Glycine max*. The state of M.P. has emerged as the Soya State in India with over 70% share of acreage as well as production. The production in the year 1996-97 was 7.6 lakh M.T. in Malwa region of M.P. Soya is cultivated in a major portion. There are a number of Soya solvent extraction plants in the state. The composition of soyabean constituents are moisture (11% max), protein(48% min), fat(1.5% max), fibre (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 industries 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, destoning, cracking, cooping, flaking, expander, extractor. In cooping, seeds are heated through jacked steam and

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open steam to soften the seed; are flaked between two rollers then flakes are dried in expander using hot air. The dried flakes are sent to extractor and hexane is sprayed on material to extract oil, the hexane is condensed out and recycled back to process. The crude oil extraction is heated up to 50° to 60° C and water and phosphoric acid is added. To remove the phosphate and gum from the oil, water and phosphoric acid is added. To remove the 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 deodorised by heating at 220°C.

In the above oil extraction process, major chemicals used are hexane, phosphoric acid, bleaching agent and caustic solution. The influent of the process is discharged in ETP for treatment and the treated effluent finally is used for irrigation or discharged outside that effects on the ground water quality.

### Sampling sites and analysis

To study the effect of pollution on groundwater Betul oil & flour Ltd., Prestige Vanaspati, Prakash Solvent, General Foods Ltd., Rama Phosphate, Alpine Pvt. Ltd. industries located in Betul, Indore and Dewas Dist. of Madhya Pradesh were selected and sample were taken from the nearby area of these industries, throughout the year.

APHA (1985) and Trivedy and Goel (1984) have been used for the analysis of groundwater for temperature, colour, pH electrical conductivity, total dissolved solids, turbidity alkalinity, total hardness, calcium and magnesium hardness, chloride, sulphate and phosphate.

## RESULTS AND DISCUSSION

It was observed that the pH of all water samples varies between 7.4 to 8.3 (within limits). The samples collected from the Pithampur industrial area near and inside the Soya plants were found acidic in nature.

Electrical conductivity is the measure of capacity of a substance to conduct electric current. The specific conductance of 30% of water sample was under the permissible limit of WHO (1984) indicating the suitability of water for different purposes. High conductivity (1575µs) shown by the samples collected from Soya plant and lowest conductivity (223). The conductivity of the water increased by the contamination of wastewater.

The groundwater in Dewas and Indore industrial area is mainly alkaline. It contains mainly chlorides, sulphates, nitrates and fluorides of Calcium, Magnesium, Potassium and Sodium respectively. High values of chlorides and calcium in drinking water are generally not harmful to human beings. But very high concentration of chlorides may affect some persons who already suffer from disease of heart and kidneys and water with high calcium content are undesirable for household uses. Total alkalinity of all the samples was above the WHO permissible limit (270 mg/L.)

Value of hardness was high by in samples of 250mt away from industry i.e. 249mg/L in terms of Calcium carbonate. Higher concentration of magnesium hardness was found in the groundwater of industry Betul oil and Flour mill. High concentration of Mg<sup>1</sup> combined with sulphate acts as laxative to human beings. These parameters in the ground water of different industrial

**Table 1**  
Physico-chemical parameters for water analysis

	Betul oil & flour mill	Prestige vanaspati	Prakash Solvent	Genaral foods Ltd.	Rama Phosphate	Alpine Pvt.
pH	7.9	7.8	7.7	8.1	7.7	8.3
EC, µs	1575	1223	370	504	715	462
Acidity	16	14	10	19	11	21
TDS	845	146	233	1236	1230	296
Alkalinity	224	150	204	260	1 46	270
Hardness	374	116	80	312	320	126
Ca Hardness	236	56	38	75	249	42
Mg Hardness	137	60	42	27	71	109
SO <sub>4</sub> <sup>-2</sup>	186	185	28	196	203	184
PO <sub>4</sub> <sup>-2</sup>	9	27	47	51	7	4 6
Chlorides	64	41	50	54	28	62

Note : All values in mg/L, otherwise stated.

areas are Total Hardness, Alkalinity and Total dissolved solvents which had maximum values 374 mg/L, 224 mg/L and 1236 mg/L respectively.

Presence of high concentration of minerals in water is responsible for high TDS values. Concentration to TDS can also be estimated on the basis of electrical conductivity measurements. Hardness of water increases due to presence of carbonate and bicarbonate ions in ground water.

Reason for high quantity of these parameters due to the accumulation of minerals, salts from the industrial wastewater to the soil and leaching to the ground water. The conductance, chlorides and sulphates in the water indicates the level of mineral concentration in the water. They were to be observed higher than the recommended CPCB values.

## CONCLUSIONS

Several physico-chemical parameters and their variability have been studied in relation to the pollution in water. The different parameters measured during the study have higher values which affect the Ecosystem. Total alkalinity of all the samples was above the WHO permissible limit (120mg/L). The chemical analysis showed that polluted site of Betul oil and flour mill. Alpine Pvt. Ltd. And General Foods Limited contained high values of chloride, total hardness and alkalinity . which indicate a high pollution load. The present study indicates greater impact of soyabcan plants activity on underground water quality. These studies also have resulted in several policy changes and strict regulatory measures for water quality maintenance in the system.

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