Physical and chemical properties of soil in industrial area of kotdwar uttarakhand

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***Abstract*: To determine the physical and chemical properties of soil of kotdwar Uttarakhand to reveal the risk of pollution on Soil and water. Both water and soil samples were checked for Total dissolved solids (TDS), Turbidity, pH, Alkalinity, Fluoride, Chloride and Total hardness. The soil sample was checked for pH and number of microorganism. Result was obtained and compared with the control areas. The study concluded that industrial area may be polluted with organic pollutants which resulted in change in some chemical parameters of water mainly total hardness and change in soil pH. Soil sample collected from polluted areas. The polluted area due to increased stress level of microbial diversity was reduced near industrial areas. Sampling and analysis of soil, water is valuable to determine the physio-chemical parameters of the micro environment around and sampled values were found higher as compared to control, which may be due to temperature variations and presence of pollutants among various parameters of water quality; chloride and TDS was found to be higher around the industries.**

***Keywords*: Physio-chemical, Micro-enviroment, parameters, Soil quality, Microbial diversity, Turbidity**

INTRODUCTION

The present study was undertaken to determine and to find out the effects of industrialization on soil and water of kotdwar industrial and it's adjoining places. samples are collected From different industrial areas of kotdwar were the Iron industry, Pharma company and other factories are situated. And also collected from the near about area which is away from the industrial area. The present study was generally required to determine the seasonal changes in soil microbial biomass carbon, nitrogen, and phosphorus in the temperate forest of Uttarakhand Himalaya.The occurence of soil contamination of natural microbial communities can significantly affects.soil moisture,organiccarbon,potassium have a strong influence on the microbial biomass. The release of pollutants and waste differs from industry to industry. For e.g. Leather industry waste is mainly composed of chromium, zinc , copper, sulphides, carbonates, sodium and many other toxic organic compounds and inorganic compounds Pulp industry mainly contain carbohydrates, textile industry contain dyes, plating industry contain nickel (Nouri et al., 2009). The present study was conducted to determine the impact of industrial pollution on water, soil and vegetation.The study concluded that industrial area may be polluted with organic pollutants which resulted in change in some chemical parameters of water mainly total hardness and change in soil pH. Soil sample collected from polluted areas.The polluted area due to increased stress level of microbial diversity was reduced near industrial areas.Sampling and analysis of soil, water is valuable to determine the physio-chemical parametersof the micro environment around the industries. which may be due to temperature variations and presence of pollutants among various parameters of water quality; chloride and TDS was found to be higher around the industries.The present study was conducted to determine the impact of industrial pollution on soil The waste and pollutants from industries affect soil, water and vegetation equally. The release of pollutants and waste differs from industry to industry. For e.g. Leather industry waste is mainlycomposed of chromium, zinc , copper, sulphides, carbonates, sodium and many other toxic organic compounds and inorganic compounds Pulp industry mainly contain carbohydrates, textile industry contain dyes, plating industry contain nickel (Nouri et al., 2009).

These pollutants not onlyalter the quality of soil and ground water but also pose serious problems (Karthikeyan et al.2010).Microbial activity in the ecosystem as they are sensitive to environmental conditions(Wardle 1992; Maithani et al.1996; Bardgett et al. 1999). They provide precise and immediate information on soil quality. Moreover, the variation in soil microbial biomass afects soil fertility and stability (Bardgett et al. 1999; Angst et al. 2018). Presence of large soil particles reduces the soil moisture content pores and consequently increases with soil organic matter level. It is related to soil moisture content, textural class, structure, salt content and organic matter. The increase in case of coarse textured soil is larger than that in the fine textured soil. Bulkdensity of the soil changes with land use and management practices. Organic matter supplied through the sludge and other kind of wastes which effect the soil.Schlesinger and Andrews 2000; Babur and Dindaroglu 2020; Luo et al. 2020; Srivastava et al. 2020; Wu 2020). Few studies also reported that soil biological changes are mostly afected by temperature, moisture and seasonal variations Maithani et al. 1996; Bardgett et al. 1999; Devi and Yadava 2006; Srivastava et al.2020).Seasonality is an important response of any natural ecosystem that has ramifcations over its biodiversity and ecosystem functioning (Tonkin et al. 2017).

Materials and Methods

The Study area and sample collection: The study areas of Uttarakhand, Kotdwara situated between latitudes 29 °45'0 N and 31°2'N and longitudes 78° 31' 48E. The area of Kotdwara the main industrial area is siggadi, jhandichaud,jhasodharpur, kishanpuri, Balbdrapur, These are thel area along to factories.the region away from the industrial area are Uttari-jhandichod,kalalkhati,haldukhata, Manpur, shivpur. with three main seasons winter (October–February), summer (March–June), and rainy (July–September). Soil samples were collected during winter, summer and rainy seasons during 2020-2021 from the temperate forest. soil samples were collected randomly from 0–15 to 15–30 cm soil depths using a soil auger. After removing the

litter layer these were mixed to obtain composite samples. The soil samples were sieved (<2 mm) to remove stones, pebbles, roots and plant material and analysed for soil physico-chemical and microbial properties. Soil texture and moisture content were determined by following the Anderson and Ingram (1994). The pH of the soil was measured by using pH meter (Eutech, SN-2069212) with soil water suspension (1:2.5 w/v H2O).

Water Sampling:
For water analysis, two sampling sites were chosen one for control and other as polluted site from both the cities. Water Samples from different sites were collected in the plastic cane of 2.5 litre, about ½ litre water samples was collected from one hand pump from one site and these were mixed to get one sample from one site. In this way sample collected were analyzed in 2-3 days so no special preservation required.

Soil Sampling:
For soil sampling samples are collected from along and away from the industrial area composite sampling was done, where sub-samples were collected from randomly selected locations in a field, and the subsamples are composited for analysis. The soil samples were then air dried and tested in laboratory.

Methodology:
For studying the impact of industrialization on soil and water near the industrial site was chosen and following parameters were compared between control site and industrial site.For water quality analysis around control and industrial site various water parameters like Total dissolved solids (TDS), Turbidity, pH, Alkalinity, Fluoride, Chloride and Total hardness were analyzed using water testing kit. For assessing the impact of industrialization on soil, soil pH was measured and number of microbial activity determined by plate count method, around control and industrial site

Results and Discussion-
Source of pollution – The industries in SIDCUL(Kotdwar) region were started in 2013.Nearly 35 industries are established and prosper at the Sigaddi growth center. and now they are generating about millions of litres of effluents per day. Appox 70 -80% ofeffluents are discharge into the soil surface and underwater bodies. The effluents are not only rich in waste but also contain toxic materials which is dangerous and hazardous toman. The major industries draining effluents into soil surface and ground water bodies.Near SIDCUL kotdwar the iron industries also effects soil surface and soil microbes withtheir effluents.Physico chemical parameters

Effect of industrialization on water Quality:-
For assessing the quality of water for drinking purpose in kotdwar and it's adjoining region various water parameters were tested and compared with values of ISI.The value of pH in control and industrial site of pH varied from control to industrial from 7.5 to 6. pH value in industrial area and non industrial area are varies was within desirable limit of 6.5-8.5. The value of pH was in accordance with the alkalinity value, which decreased from control site to industrial site. Kotdwara it was 200mg/l in control site and 150 mg/l in industrial site.The desirable limit of TDS is 300mg/l but in both the area industrial and non industrial the TDS value was greater than desirable in both control and industrial site. But from control to industrial there was increase of TDS value from 692mg/L to 750 mg/l in Kotdwar affects the quality of water. The value of Turbidity was 0 NTU in both control and industrial which is desirable. The total hardness which is mainly caused due to calcium and magnesium salts were within the desirable limit of less than 300 ppm. The desirable limit of chloride according to ISI is 250 ppm and in both area the value of chloride decreased from control to industrial site.

Effect of industrialization on soil Quality:
For assessing the impact of industrial pollution on soil, the soil pH and microbial growth from the soil sample was analyzed. Soil pH or soil reaction is was found to be lower in industrial area of both the cities as compared to control site. The soil with pH greater than 8.5 is generally called as sodic soil. But pH of all soils samples are less than 8.5 indicating that soil samples are free from sodicity hazards. The decrease in pH could be due to the decreased amount of carbonate and bicarbonate but overall the pH value neither too high (more than 8.5) nor too low. The samples were analyzed for microbial growth and it was observed as that there was reduction in the growth of microorganisms at different dilution in both the industrial sites as compared to control site. The pH between 6 ji-8 is favorable for bacterial growth therefore in comparison to fungus bacterial count was found higher in all the samples. The decrease in number of microorganism both fungus and bacteria near industrial site as compared to control site may be attributed to altered pH of soil and water quality condition.

Physico chemical parameters –
The change in soil pH and organic carbon, total nitrogen, total phosphorus and organic matter (percent dry weight basis) contents were determined following standard procedures. The physic –chemical characters like Turbidity and conductivity, pH , temperature, chlorides, Sulphate, nitrates, phosphate and total hardness have increased in the water of the impacted
Sample

Table 3 General types of water pollutants

Class of pollutant	Significance

Heavy Metals	Health, toxicity, aquatic biota Toxicity, aquatic biota
Organically bound metals and metalloids	Water quality, toxicity, aquatic biota
Inorganic species	Toxicity
Trace organic pollutants Polychlorinated biphenyls Pesticides	Toxicity, aquatic biota, wildlife Toxicity, aquatic biota, wildlife Toxicity, aquatic biota Incidence of cancer
Detergents	Health, toxicity, aquatic biota Toxicity, aquatic biota
Chemical carcinogens	Water quality, toxicity, aquatic biota

Effects of industrial area on soil-

Table1. Detail of water sample location collected from Kotdwara

Sample Source	**Sample ID**	**Latitude**	**Longitude**
1. Underground Water	KWS (sample)	29. 472124°	78.245518°
2. Underground water	KWC (control)	29.472806°	78.259603°
3.Soil Sample	KSC (control)	29.472806°	78.259603°
4.Soil Sample	KSS (sample)	29.472124°	78.245518°

Table 2: Effect of industrialization on soil pH

Dilution	**KOTDWARA.**	
	KSC	**KSS**
1:2	6.0	6.0
2:1	7.0	6.1
1:1	7.0	6.2

Table 3: Effect of industrialization on soil quality of different area indicated A,B,C,D,E,F,G,H upto 2020 to 2021.

PARAMETER								
	Manpur	**Jhandichod**	**Kalalghati**	**Siggaddi**	**Jasodharpur**	**Haldukhata**	**Uttari-jhandichaud**	**Kishanpuri**
TDS (gm)	**0.6924**	**0.7502**	**0.6986**	**0.7894**	**0.7983**	**0.6845**	**0.6822**	**0.7988**
Turbidity	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
pH	**7.48**	**7.70**	**6.52**	**8.09**	**8.39**	**6.03**	**6.5**	**7.12**
Alkalinity(in ppm)	**200**	**150**	**200**	**151**	**126**	**153**	**124**	**156**
Fluoride(in ppm)	**0.72**	**0.1**	**0.27**	**1.02**	**1.45**	**1.67**	**0.25**	**1.67**
Chloride(in ppm)	**35.5**	**17**	**15.3**	**17.7**	**15.3**	**26.5**	**22.5**	**18.7**
Total hardness (in ppm)	**200**	**125**	**113**	**300**	**175**	**156**	**150**	**104**
Organic matter	**5.85**	**0.33**	**3.77**	**1.44**	**0.86**	**0.83**	**4.33**	**1.77**
Pottasium	**63**	**25**	**23**	**93**	**48**	**54**	**55**	**23**

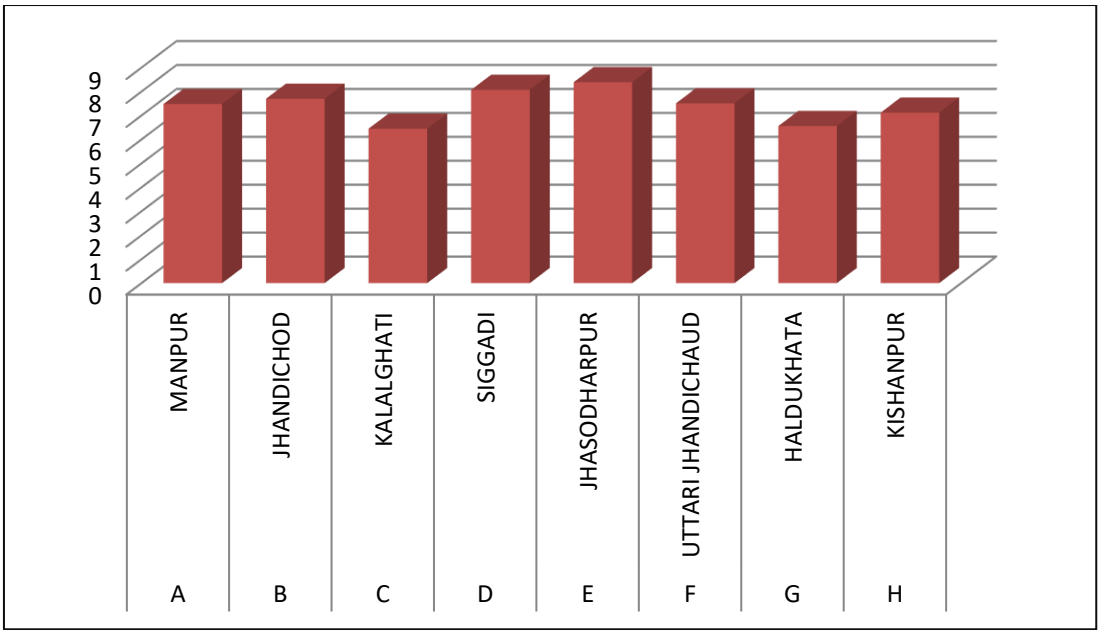


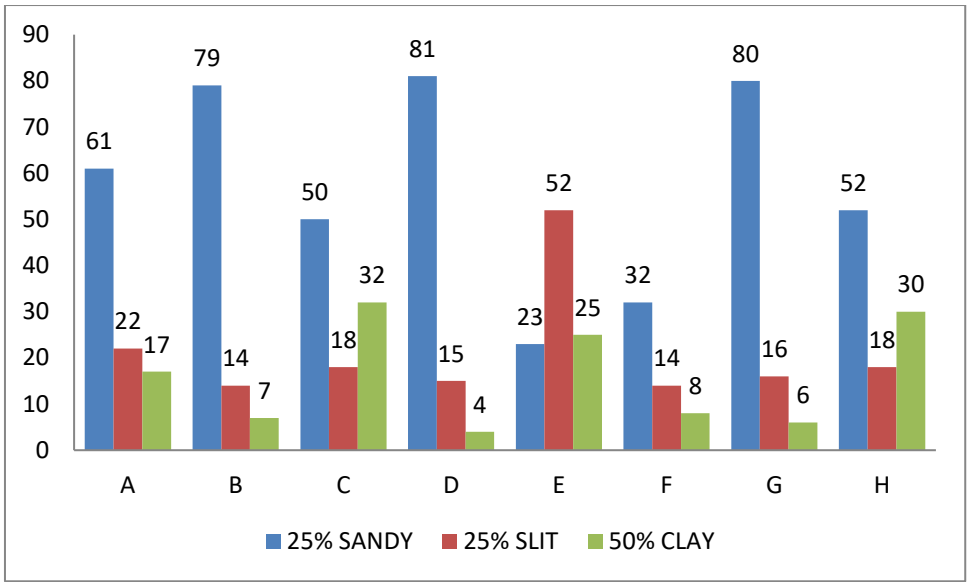
Table -4 :pH details of soil of different area indicated A,B,C,D,E,F,G,H upto 2020 to 2021.

Table 5 Microbial details of different area label with A,B,C,D,E,F,G,H

CFU/g	**Manpur A**	Kalalghati ,B	**Haldukhata C**	Siggaddi D	Uttari-jhandichaud E	Jhandichod F	Kishanpuri	Jasodharpur H
Total bacterial count(10-6)	470000	490000	860000	780000	660000	560000	680000	4800000
Total fungal count(10-6)	70000	40000	75000	60000	76000	50000	55000	300000

Table 5: Texture of different area label with A,B,C,D,E,F,G,H

Texture	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Sandy	61	79	50	81	23	32	52	70
Silt	22	14	18	15	52	14	18	16
Clay	17	07	32	04	25	08	30	08


90
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52
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A
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C
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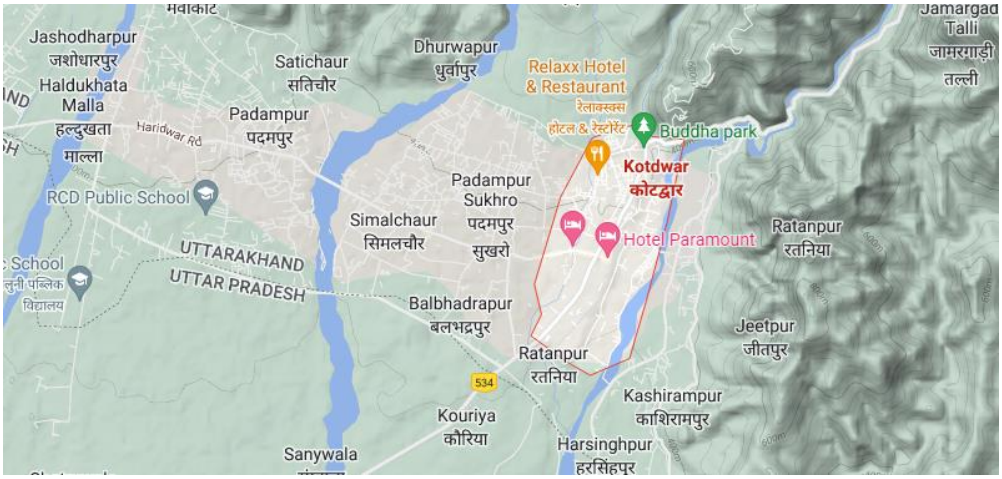
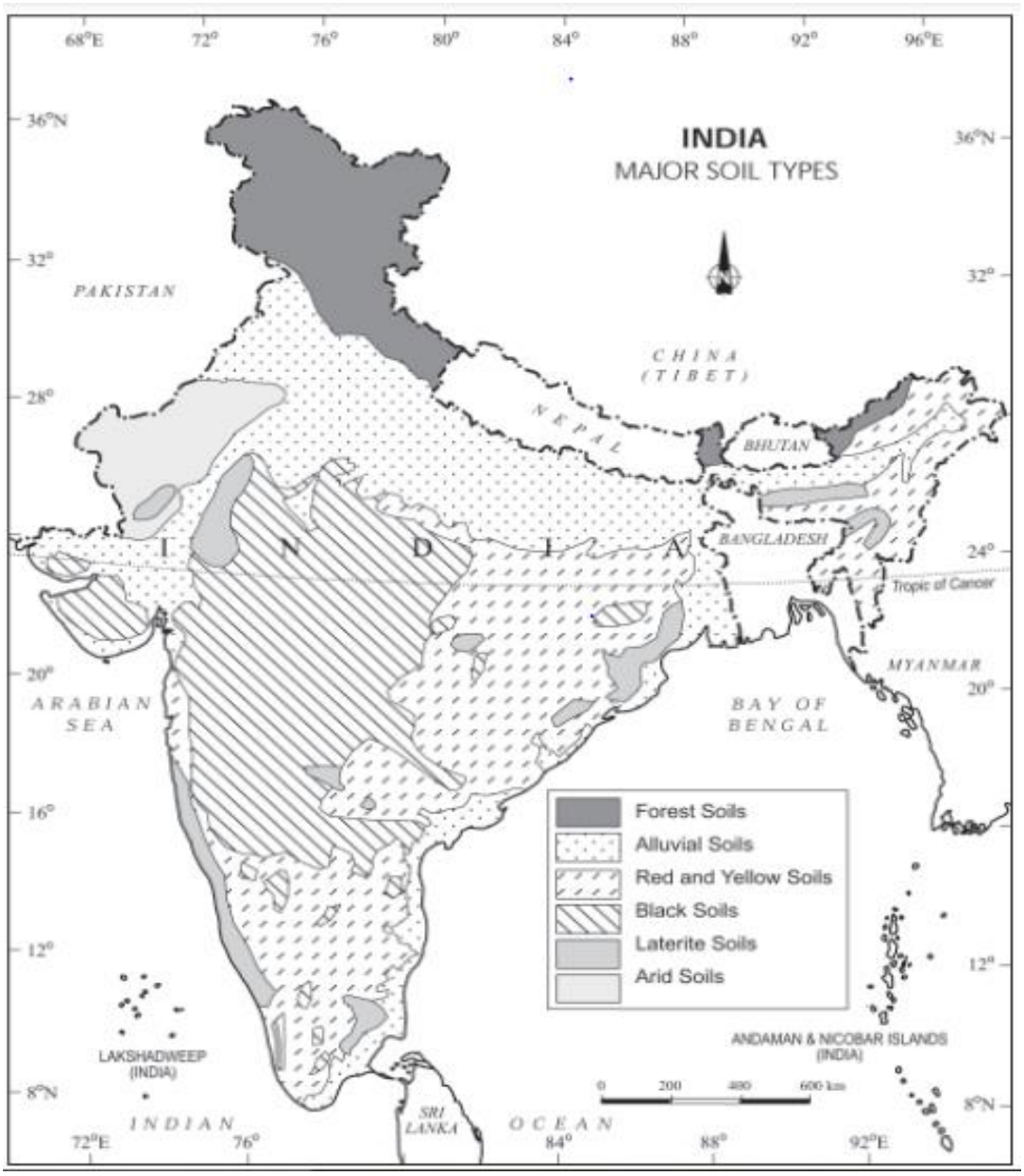
E
F
G
H
25% SANDY
25% SLIT
50% CLAY


Jashodharpur
जशोधरपुर
Haldukhata
Malla
हल्दुखता
माल्ला
Haridwar Rd
Satichaur
सतिचौर
Padampur
पदमपुर
Dhurwapur
धुर्वापुर
Relaxx Hotel
& Restaurant
रेलाक्स्स
होटल & रेस्टोरेंट
Buddha park
Kotdwar
कोटद्वार
RCD Public School
Padampur
Sukhro
पदमपुर
सुखरो
Simalchaur
सिमलचौर
Hotel Paramount
Ratanpur
रतनिया
UTTARAKHAND
UTTAR PRADESH
Balbhadrapur
बलभद्रपुर
Jeetpur
जीतपुर
Ratanpur
रतनिया
534
Kouriya
कौरिया
Kashirampur
काशिरामपुर
Harsinghpur
हरसिंहपुर
Sanywala
Jamargad
Talli
जामरगाड़ी
तल्ली



CONCLUTION-

Sampling and analysis of plants, soil, water is valuable to determine the physio- chemical parameters of the micro environment. These changes in soil fertility and it's components are biological compensatory responses to environmental stress. Among various parameters of water quality; chloride and TDS was found to be higher around the industries. Talking about ecological study the population density of plants and microbes were found less around industrial sites which shows that there is an impact of industries on population density of organisms, Soil, water. biodiversity are essential elements of ecosystem and are the subject of many agricultural, ecological, biological and hydrological studies, since large amounts of chemicals enter animal and human food chain through cultivated contaminated soils and water. The study concludes that there is a need to access the ecological risk associated with the polluted areas and necessary action must be taken in this direction.

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