Physio-Chemical And Statistical Analysis Of Ground Water Quality In Northern Part Of Karur District-Review

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Abstract:

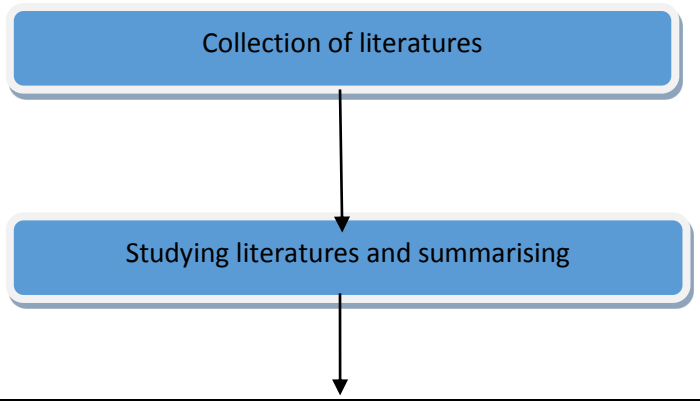
Karur district is located in banks of amaravathi and kaveri rivers ,it is well known for its handloom textiles ,blanket exports,dyeing industries and netting industries.The ground water resources are well polluted due to the untreated effluent discharges of above mentioned industries.We have analysed the physio-chemical parameters of samples from 25 various locations in January and February month at northern part of karur district.(i.e.,pH,Turbidity,Electrical Conductivity,TDS,Hardness,etc.,) and interpulated the results with statistical approach,correlation and WQI.While interpolating the results with WQI we found that 12% of samples has a very poor status(75.7068) and 4% is unfit for drinking(157.124). 98% of samples is beyond 500mg/l while calculating TDS(highest range 5800mg/l at Noyyal.EC,pH are within the permissible limits.We can observe a drastical hike of results exceeding the permissible limit of Indian standards,WHO limits.We found a peak value of chlorides(2813mg/l)while testing Noyyal sample.Correlation gives positive value while correlating alkalinity with other parameters,this shows a direct proportionality of alkalinity with other parameters.For controlling these pollution and improving the ground water quality we must ensure of not mixing oils,cleaning chemicals,untreated effluents from industries into ground water.Air sparging and stripping,GAC filters,RO methods can be used for treating contaminated ground water.

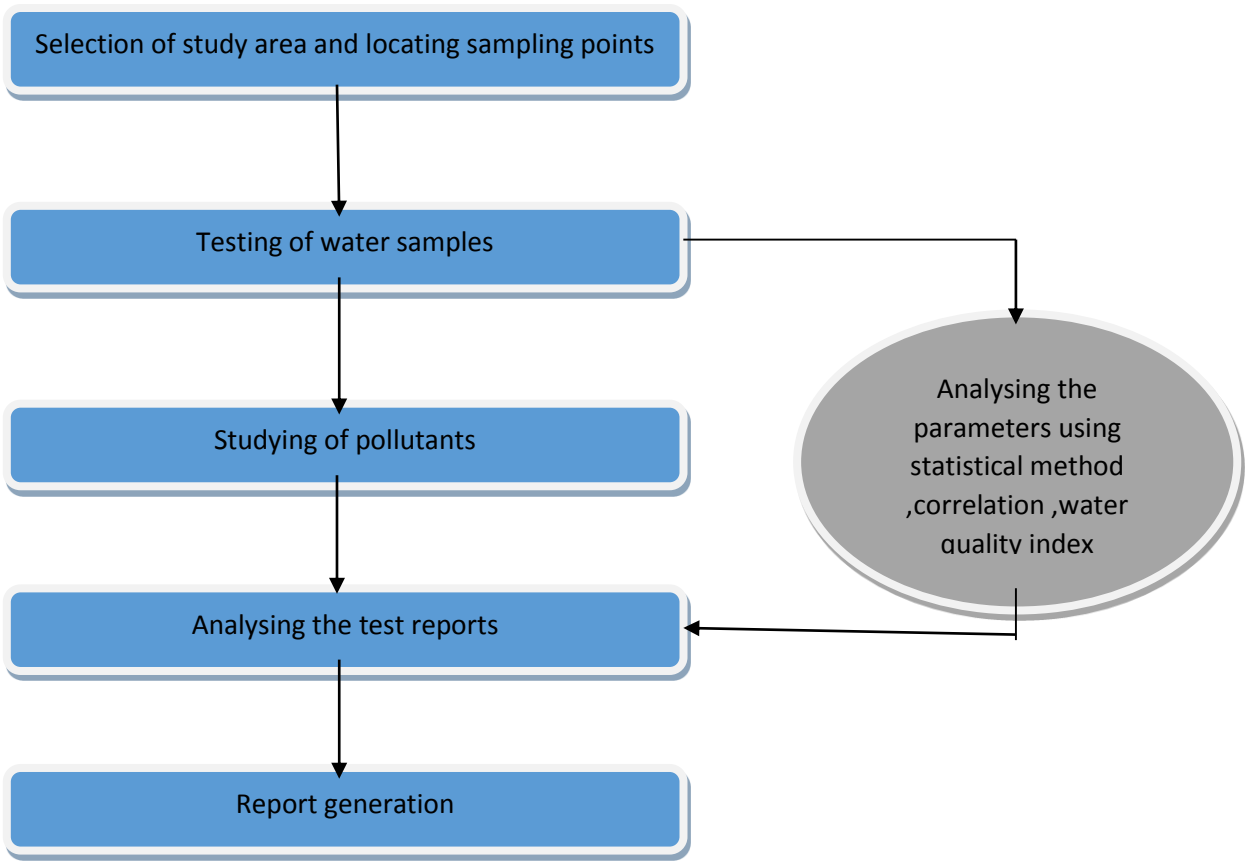
KEY WORDS: Water quality index,correlation,effluent discharge intrusion of salt water,noyyal.

Introduction:

Ground water is a natural resource which accounts about 37% of the domestic water supply needs.They occur naturally in the aquifires beneath the surface of earth and stored in the cracks of subsurface rocks.Pumping out excess ground water may lead to intrusion of poisonous minerals from the surrounding ground.Our main objective is to ensure the quality of ground water for drinking and construction purpose in karur locality and to study the impact of dyeing and knitting discharge in the ground water in our study area and for analysing the impact of high rainfall and corona curfew, lockdown effects in the quality of ground water. We have selected 25 locations in our study area(northern part of karur area) and we have tested the samples

Methodology





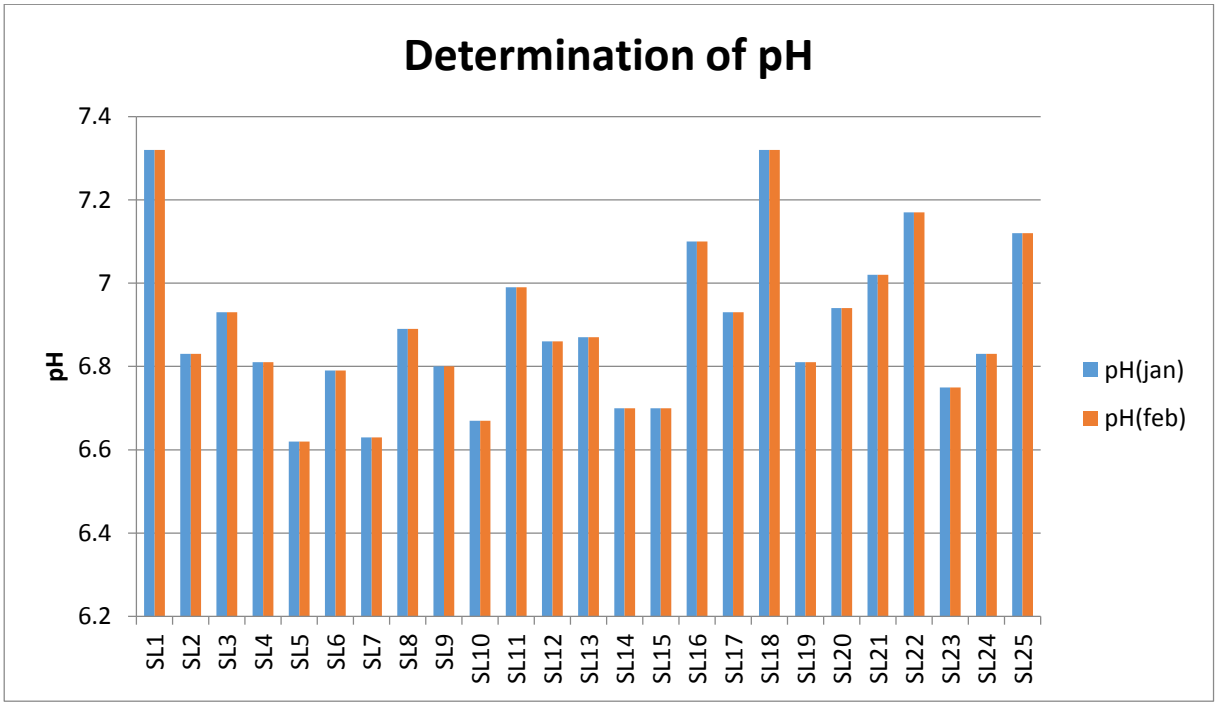
After studying few literatures we came up with suitable methodology where in which from we have collected from 25 different locations in northern part of karur district.We have tested the following physio-chemical parameter structures ph, turbidity, Electrical conductivity, Hardness, TDS, chlorides, Alkalinity, Acidity,BOD and COD etc.We have conducted the test for consecutive January and February of 2021.We have analyzed the test reports using statistical methods, correlation and Water quality index.

Sample locations:

SI.NO	Locations	Latitude	Longitude	Source
SL1	Karur town	10.9601^0 N	78.0766^0 E	Borewell
SL2	Velayuthampalayam	10.8202^0 N	78.2708^0 E	Borewell
SL3	Thanthonimalai	10.9323^0 N	78.0913^0 E	Borewell
SL4	Gandhigramam	10.9428^0 N	78.1021^0 E	Borewell
SL5	Kulithalai	10.9426^0 N	78.4172^0 E	Borewell
SL6	K.Paramathi	10.9576^0 N	77.9096^0 E	well
SL7	Vangal	11.0751^0 N	78.0856^0 E	Borewell
SL8	Noyyal	11.0512^0 N	77.9245^0 E	well
SL9	Krishnarayapuram	10.9574^0 N	78.2726^0 E	Borewell
SL10	Mayanur	10.9557^0 N	78.2369^0 E	well
SL11	Pavithram	10.9539^0 N	77.9859^0 E	Borewell
SL12	Thennilai	10.9497^0 N	77.8332^0 E	Borewell
SL13	Punnam	10.9905^0 N	77.9950^0 E	Borewell
SL14	Pugalur	11.0595^0 N	77.9938^0 E	Borewell
SL15	Puliyur	10.6390^0 N	77.8326^0 E	Borewell
SL16	Nedungur	10.9464° N,	77.9344° E	Borewell
SL17	Ariyur	12.8757° N,	79.1019° E	Borewell
SL18	Manavasi	10.9338° N,	78.2206° E	Borewell

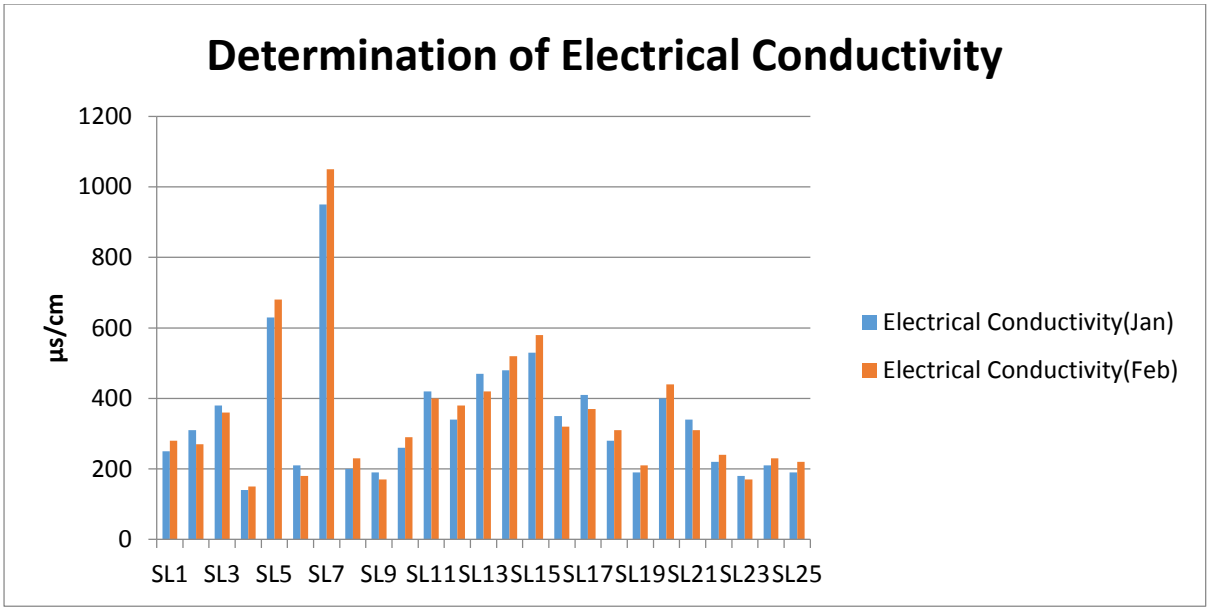
SL19	Uppidamangalam	10.8998° N,	78.1586° E	well
SL20	Jagadabi	10.8651° N,	78.1834° E	Borewell
SL21	Kattalai	8.8022° N,	77.7721° E	Borewell
SL22	Veluswamypuram	10.9668° N,	78.0545° E	well
SL23	Thirumanilayure	10.9497° N,	78.0833° E	Borewell
SL24	Emur	10.9214° N,	78.1263° E	Borewell
SL25	Karuppur	11.7172° N,	78.0918° E	well

Ph:



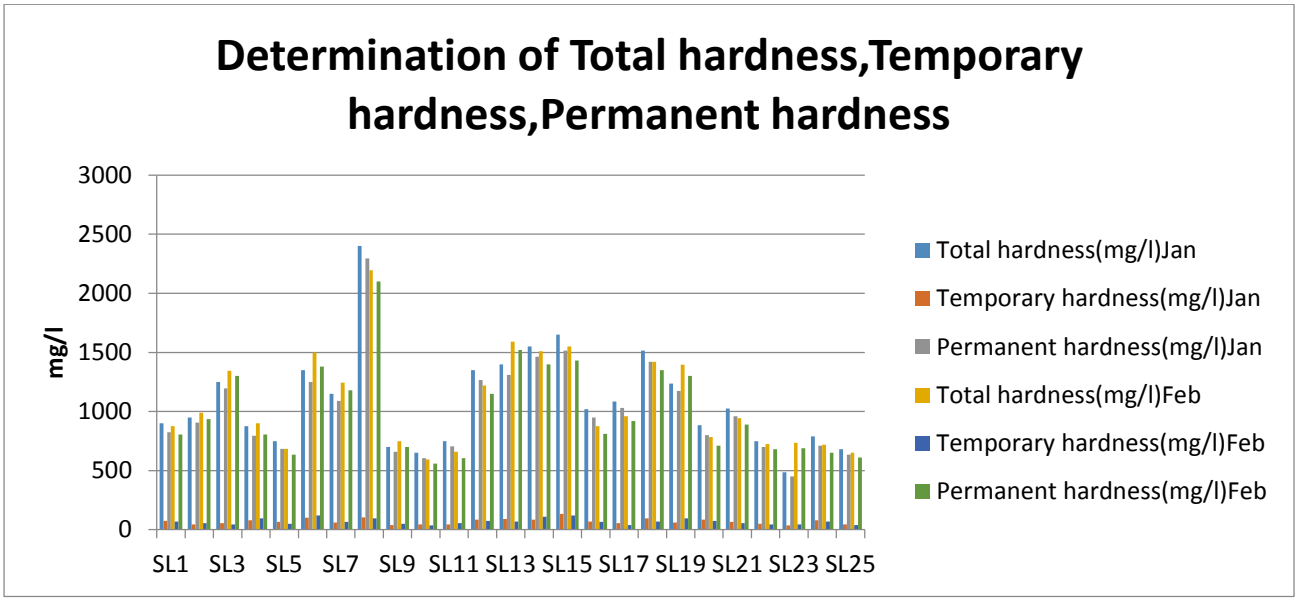
pH denotes the potential of hydrogen or power of hydrogen.The scale reading ranges from 0 to 14.The IS permissible limit of pH is 6.5 to 8.5 all our samples are with in the permissible limit.pH below is set to be acidic where as pH greater than 7 is alkaline in nature. Our peak pH value is determined at Manavasi and Karur Town(7.32),our lowest pH value is noted in SL5.Lower pH value leads to corrosion of steel reinforcements,pipes,storage cylinders,etc.,.

Electrical conductivity:



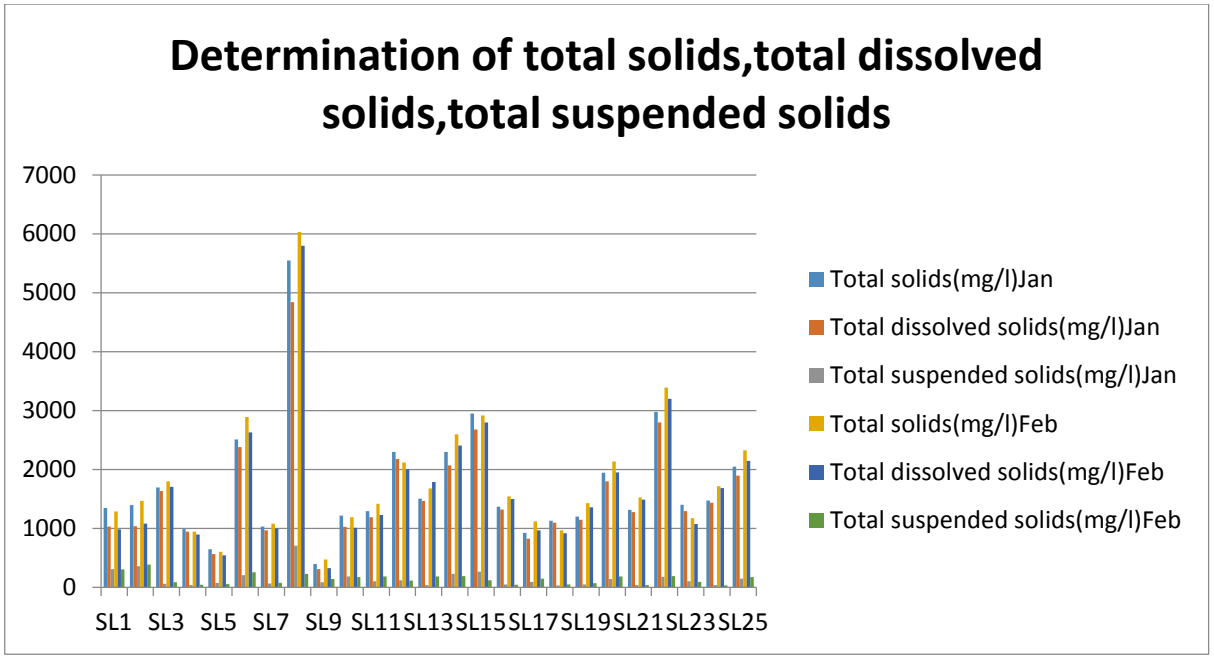
The ability of charged ions in water to conduct electricity is termed as electrical conductivity of water. The electrical conductivity of any water is directly proportional to the concentration of charged ions present in that water. The IS permissible limit of electrical conductivity is 2000µs/m. The highest value is obtained at Vangal,whereas lowest in Gandhigramam. Higher the electrical conductivity reading higher the chemical concentration is.

Total hardness:



Hardness is due to magnesium,calcium carbonates, bicarbonates and sulphates it is further classified into temperaury and permanent hardness. Temperaury hardness can be removed by just boiling the water whereas the permanent hardness can be removed by suitable physical and chemical methods. The IS permissibe limit of hardness is 200 to 600 mg/l.Our samle SL8 has a value 4 times greater than the permissible limit(2400mg/l). Less than 4% of the sample lies with in the permissible limit.If the hardness of the water used for construction is greater it makes the reinforcement less flexible and increases the brittleness.

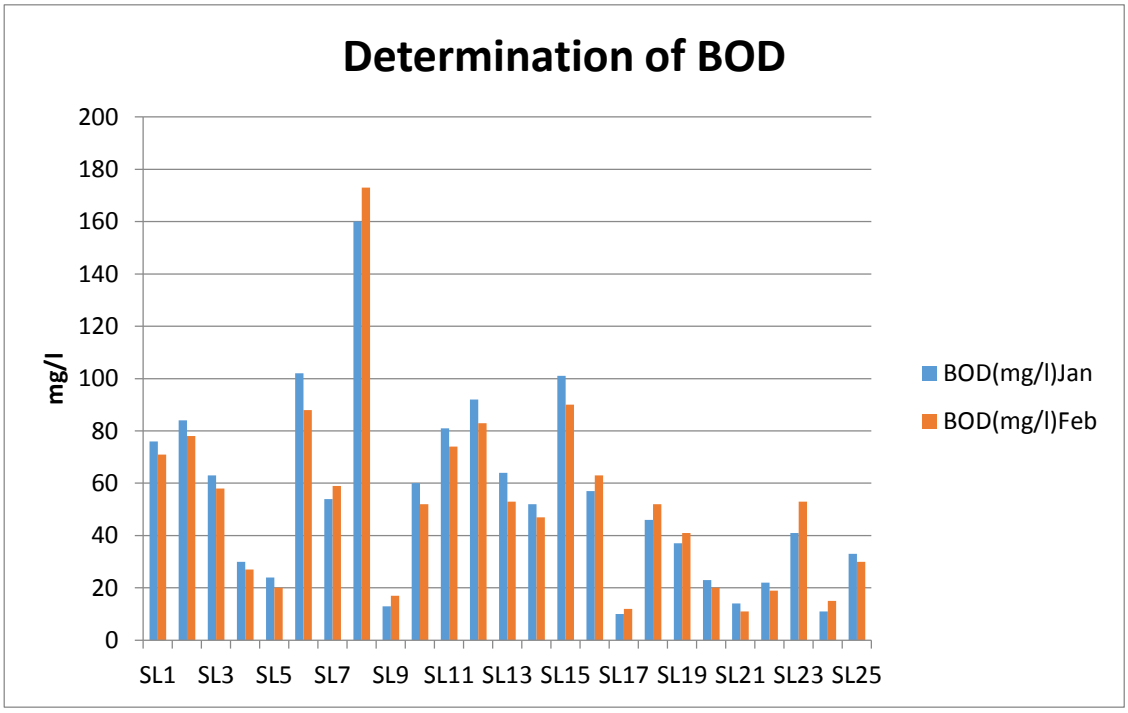
Total solids:



Total solids = Total suspended solids + Total Dissolved solids

The IS permissible limit for TDS lies between 500 to 2000mg/l.TDS values of 80% of our samples lies between the permissible limit.This includes silts,planktons and salts like Nacl etc.We have obtained high TDS value(5800 mg/l) in the month of february from the noyyal sample.So we can easily conclude formation of scales,high hardness and staining in the pipes,storage units presenting the noyyal area.Deionisation and reverse osmosis can be used to reduce TDS in these locality areas.

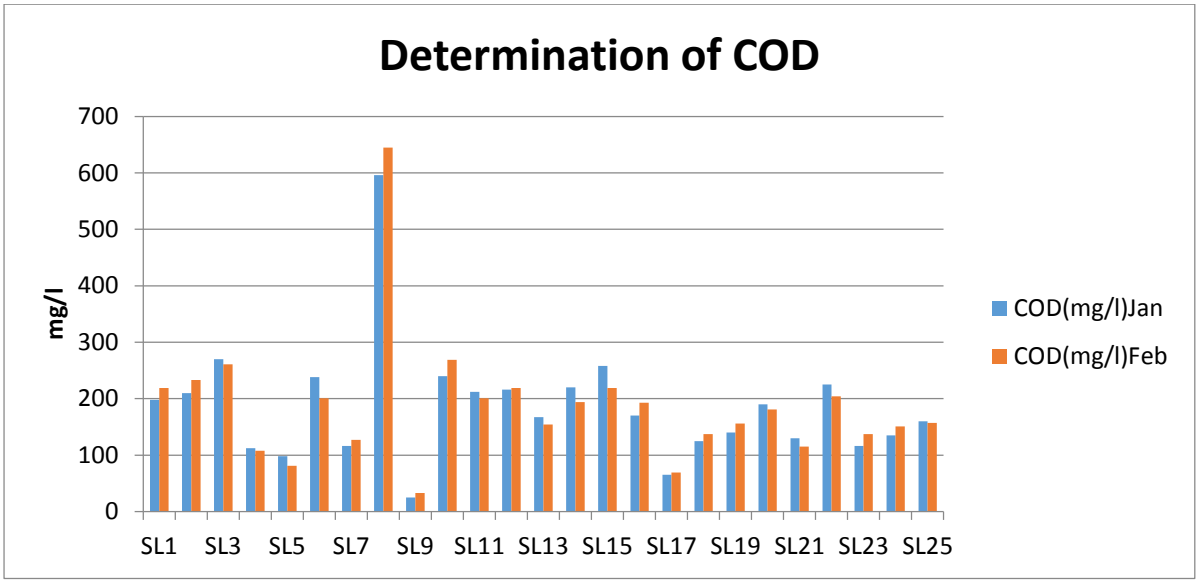
BOD:



BOD(Biological Oxygen Demand) is the quantity of O_2 needed for bacteria to decompose the organic matter present in the solution.The IS permissible limit of BOD is 30mg/l.Higher the BOD content lesser the life compactability of aquatic

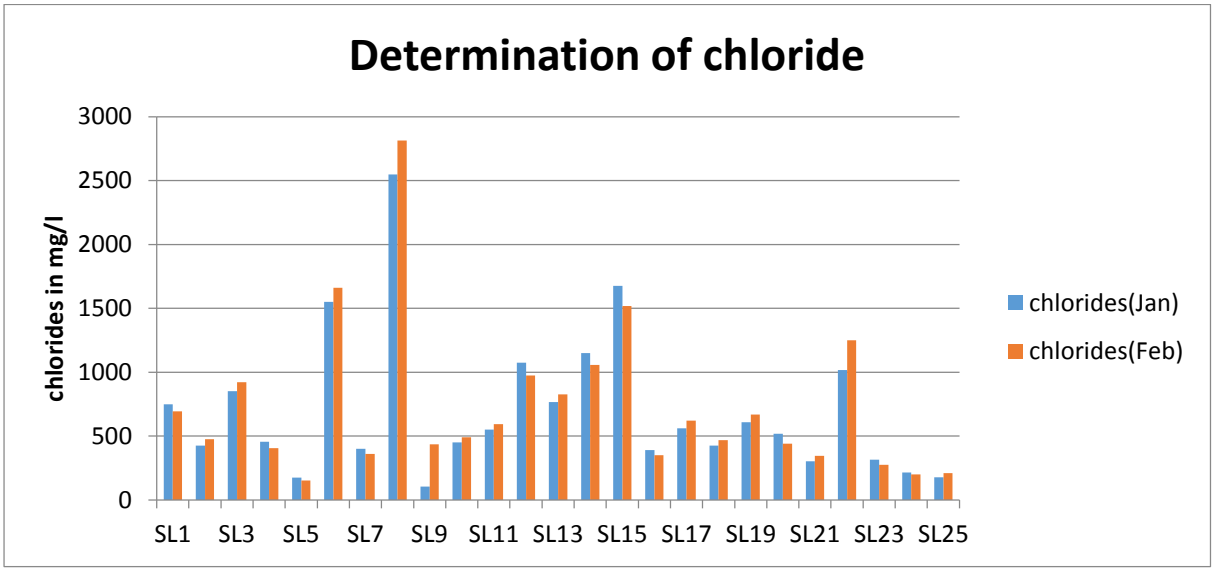
organisms in water.40% of our samples are with in the permissible limit.While accounting our sampling location Noyyal,our sample SL8 has a peak value of BOD which is 5 times higher than the permissible limit.Our samples Puliyur and K.Paramathi has a BOD value greater than 100mg/l.

COD:



Both waste water quality and water quality can be determined using chemical oxygen demand(COD). Higher the COD level,lower the dissolved oxygen level is which causes a greater detoriation in aquatic lives we can find more cod in effluents from tanning,dyeing and knitting industries which is a greater problem in our research area. The permissible limit of COD according to the Indian Standards is 250mg/l. our samples noyyal ,puliyur, thanthonimalai have a higher COD value where as our 80% of the remaining samples are with in the permissible lim

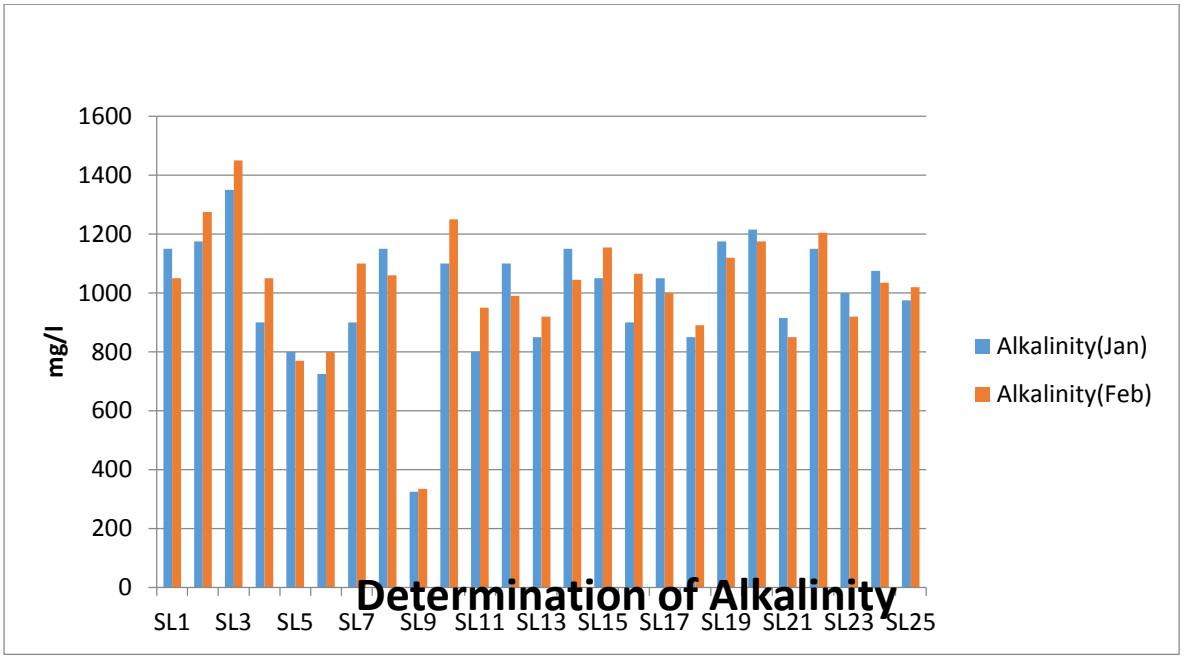
Chlorides:



Chloride is naturally found in waters due to the salts like Nacl and Kcl. The permissible limit of chlorides in drinking water is 250mg/l. The rate of corrosion(pittting) is directly proportionate to the amount of chloride detected in the water used for construction. Chlorides can be removed by using ion exchange methods and reverse osmosis method. Now a days vitamin C is used to neutralise chlorine present in the water. Our sample Noyyal has a chloride value 10 times greater than the permissible imit(2813mg/l).20% of our samples puliyur ,pugalur, thennilai,velusamypuram and K.paramathi has a chloride value 4 to 5 times greater than the recommended standards. Chloride determination is used to control ground water pumping

from locations where sea water intrusion is a problem.To remove chlorides from water reverse osmosis and ion exchange methods can be used.

Alkalinity:



The ability of a solution to neutralise both acids and base to have a fair pH level is determined as alkalinity the IS permissible limit of alkalinity is 200 to 600mg/l. Only one of our sample SL9 lies within the permissible limit. Remaining 96% of our samples are beyond the permissible limit which may result in high scaling effect in those areas. Our sample SL3(thanthonimalai) has a highest value(1450mg/l). we have determined 3 alkalinity parameters OH^-, CO_3^{2-} and HCO_3^-, only we found carbonates and bicarbonates in our sampling locations.

Statistical Analysis:

Parameters	**Max**	**Min**	**Mean**	**Median**	**Mode**	**Standard deviation**
pH	7.32	6.6	6.888	6.86	7.32	0.20143
Turbidity	0	0	0	0	0	0
Electrical Conductivity	1000	145	346.2	310	210	187.58
TDS	5790	438	1775.68	1465	4165	1085.54
Chloride	2681	121	705.92	503.5	387.5	578.18
Hardness	2297.5	540	1079.4	982.5	812.5	409.98
Acidity	0	0	0	0	0	0
Alkalinity	1630	240	1006.2	1017.5	975	318.61
BOD	166.5	10.5	52.92	52	58.5	35.71
COD	617.5	29	185.96	175.5	167.5	108.37

Statistical analysis gives a clear vision while analyzing the ground water quality datas comparatively.We have collected the samples from the same location in consecutive months.So the improvement and the depletion in the quality of ground water can be easily pointed out while using statistical method for analysis.We have taken the following statistical parameters namely minimum,maximum,mean,median,mode and standard deviation.

Correlation:

	Ph	EC	TDS	CL	TH	ALK	BOD	COD
ph	1							

EC	-0.32899	1						
TDS	0.114679	-0.13897	1					
CL	-0.00231	-0.06334	0.887196	1				
TH	-0.03294	0.141003	0.665264	0.808519	1			
ALK	0.215226	0.053612	0.322338	0.261151	0.1643032	1		
BOD	-0.01359	0.015488	0.648329	0.79859	0.6972719	0.213579	1	
COD	0.097919	-0.13125	0.851651	0.837966	0.6350214	0.456811	0.838634	1

Correlation is a statistical method which can be used for determining the relationship between two quantitative parameters(Variables).We have analysed samples using pearson correlation method.In this method we can get either positive value or negative value.Positive value describes the direct proportionality between the parameters on the other hand.Negative value describes inverse relationship between the parameters.

Correlation between same parameters gives 1.While correlating the parameters we get mostly positive values which shows the direct relationship between those parameters. For say,we get 0.79859 while correlating BOD with chlorides.This shows the direct proportionality between those two parameters.The negative values indicates the inverse proportionality relationship between the parameters.For say, we get -0.13897 while correlating TDS with electrical conductivity.

Water Quality Index:

Sl.NO	SAMPLE LOCATION	WQI(water quality index)	REMARKS(water quality status)
1	Karur town	39.06	Good
2	Velayuthampalayam	54.48	Poor
3	Thanthonimalai	65.33	Poor
4	Gandhigramam	46.66	Good
5	Kulithalai	37.6676	Good
6	K.Paramathi	79.47	Very poor
7	Vangal	54.057	Poor
8	Noyyal	157.124	Unfit for drinking
9	Krishnarayapuram	24.23	Excellent
10	Mayanur	53.341	Poor
11	Pavithram	47.6676	Good
12	Thennilai	71.47	Poor
13	Punnam	63.715	Poor
14	Pugalur	67.485	Poor
15	Puliyur	83.251	Very poor
16	Nedungur	55.299	Poor
17	Ariyur	55.60	Poor
18	Manavasi	58.370	Poor
19	Uppidamangalam	66.46	Poor
20	Jagadabi	56.8335	Poor
21	Kattalai	52.164	Poor
22	Veluswamypuram	75.7068	Very poor
23	Thirumanilayure	43.127	Good
24	Emur	48.6115	Good
25	Karuppur	52.614	Poor

WQI is an necessary tool in determining the quality of drinking water,it shows the composite influence of different parameters in a wholistic view.Only 4% of our sample which is collected from noyyal(157.124) is unfit for drinking.On the other hand 24% of our samples has good water quality status and the sample which is collected from krisnarayapuram(24.23) has an excellent water quality status.

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