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Carbon - based materials derived from Phoenix Dactylifera (date palm) seeds, Magnifera Indica (mango) seeds, and Peltophorum Pterocarpum (Copper Pod) seeds were used in batch adsorption studies of fluoride.

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Abstract - Fluoride was removed after a artificial sample through adsorption on physical activated carbons produced since Phoenix Dactylifera kernels .Magnifera Indica (Mango) seeds, and Peltophorum Pterocarpum (Copper Pod) seeds was carried out at room temperature of 32°C. 1oC. Batch studies were carried out on physically activated carbon to determine the best time, dosage, and pH for Fluoride removal. The best Carbon contact period, adsorbent dosage, and pH were 40 minutes, 140 milligrammes, and 7.50, 40 minutes, 160 milligrammes, and 7.50, and 35 minutes, 120 milligrammes, and 7.50, with fluoride removal efficiency of 77.5 percent, 76.5 percent, 45 percent, 58 percent, 96 percent, and 78.96 percent, 87.99 percent, 97 percent, respectively.

KeyWords-Fluoride, Activated carbons, Time of Contact, Dosage effect, pH, Phoenix Dactylifera (Date Palm) seeds, Magnifera Indica (Mango) seeds and Peltophorum Pterocarpum(Copper Pod)

INTRODUCTION

Water is life, but we are still unable to provide everyone with safe drinking water that is both accessible and inexpensive. Water is an essential component of life for all living things. However, only a small percentage of the population has access to potable drinking water anymore. Others drink polluted water to varying degrees. The topic of providing clean drinking water is causing a lot of anxiety everywhere from the world, especially in emerging and poor countries. Because India is a developing country with a big population existing in villages with little organization, a high prevalence of the concept of safe drinking water is hampered by illiteracy and a lack of sanitation and hygiene understanding becomes even more important. The majority of the rural population, on the other hand, drinks contaminated ground water that is a source of contamination range minerals and salts. Among them is an excessive quantity of fluoride in the water, which is injurious to people's condition. Fluoride is a poison that is less harmful than arsenic but more toxic than lead,and it accumulates in the body. Dental and skeletal fluorosis are caused by drinking dirty water on a regular basis, as well as a number of other health conditions such as gastrointestinal difficulties. Because "Fluorosis" is considered an incurable condition, the only way to solve this problem is to prevent it. As a result, investigations on the de-fluoridation of water utilising a range of adsorbents have become increasingly important in recent years.

De-fluoridation can be accomplished using a variety of ways, including reverse osmosis, electrodialysis, and ion exchange. NEERI's Nalgonda de-fluoridation process has recently gained popularity, however it has its own set of limitations. De-fluoridation activity is also tested with a variety of adsorbents. De-fluoridation capacity of activated alumina is said to be high.

OBJECTIVES:

1. The first step is to make physical activated carbons.
2. To determine the properties of the carbons that have been prepared.
3. To determine how much fluoride an adsorbent can remove as a function of adsorbent dosage, contact time, and pH.

MATERIALS AND METHODOLOGY

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MATERIALS:

Phoenix Dactylifera (Date Palm) fruit, Magnifera Indica (Mango) seeds, and Peltophorum Pterocarpum seeds were utilised to make carbons (Copper Pod). Physical properties of carbon, were measured and are listed in Table 1 below.

CHARACTERISTICS OF ACTIVATED CARBONS:

Before employing Phoenix dactylifera (Date Palm) seed, Magnifera Indica (Mango) seeds, or Peltophorum Pterocarpum (Copper Pod) carbon as an adsorbent, it is vital to understand some of its features. Some of these factors and the carbons prepared. Table 1 summarises the findings.

Table.1 Characteristics of Prepared Activated Carbons

SL.NO	Characteristics	Physical Activated Carbon		
		Date Palm Seeds	Mango Seeds	Copper pod seeds
1	Moisture level (percent)	4.01	6.76	5.01
2	Content of ash (%)	11.77	15.20	16.63
3	(mg/g) decolorizing power	30.0	45.0	116.7
4	Surface area (m^2/g)	503.31	580.64	596.90
5	pH	9.50	7.2	9.01
6	Specific gravity	1.218	1.218	1.5
7	Density of Bulk (g/cm3)	0.45	0.262	0.240

The investigation was acted upon according to the 20th edition of "Standard Methods."

METHODS:

PREPARATION OF PHYSICAL ACTIVATED CARBONS:

The seeds of Phoenix dactylifera (Date Palm) Magnifera Indica (Mango)Seeds and Peltophorum Pterocarpum(Copper Pod) were washed, and cracked into pieces, then eroded in purified water for about 8 to 9 times. The powder was then oven dehydrated at 105±5°C for 24 hours. The oven dehydrated powder was occupied in small flask in three layers, by compressing each layer starved of any air space to avoid the loss in bulk of the powder, else, the substance would be directly burned, leaving merely the ash behind. The minor container was then placed into a superior container, such that sand enclosed the small container totally, the lid of the bigger container was strongly fitted. Then the setup was kept in muffle furnace and heated at stable rate to attain the temperature of 800°C. Thirty minutes after achieving the 800°C temperature the furnace was permitted to cool for about 10 hours and then the basin is taken out.The galvanized Carbon thus gained was filtered to 300 Micron in dimension, then crammed in polythene bags and deposited in dessicator.

DETERMINATION OF OPTIMUM CONTACT TIME:

The duration of contact has a significant impact on adsorption. 100mL of 5mg/L fluoride solution was assorted with 100mg of initiated carbon, and the mixture was agitated at various contact times ranging from 5 to 30 minutes to explore the effect of contact time (10mins, 20mins, 30mins up to 120mins). The fluoride concentration in the filtrate was then determined using a UV-visible spectrophotometer.

DETERMINATION OF OPTIMAL DOSAGE OF ADSORBENT:

To conclude the best quantity of activated carbon derived from Phoenix dactylifera , Magnifera Indica (Mango) seeds, and Peltophorum Pterocarpum it was tested in a conical flask containing a known absorption of fluoride results (5 mg/L in 100mL) at various dosages ranging from 1 to 5 mg/L. (20mg, 40mg, 60mg up to 180mg). After the result in the conical flasks was swirled for optimal interaction period, the filtrate was analysed for remaining fluoride content using a spectrophotometer.

DETERMINING THE OPTIMAL PH FOR FLUORIDE ADSORPTION:

The pH at which adsorption takes place has a substantial impact on the amount of adsorption that takes place. The influence of pH on fluoride adsorption was investigated using symmetry adsorption trials at varied starting pH values ranging from 2.0 to 9.0. The pH of the key was changed using 0.1N H2SO4 or 0.1N NaOH. The activated carbon was combined and agitated for the entirety of the optium contact period, and the filtrate was analysed for remaining fluoride absorption. The optimal refers to the pH at which maximum fluoride deduction occurs.

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RESULTS AND DISCUSSIONS

TIME TO CONTACT EFFECT: The contact time has been extended a significant impact on the process of adsorption. Figure 1 shows how contact time affects the elimination of fluoride from drinking water a synthetic sample. The extent of Fluoride adsorption has been discovered to increase with time and achieve equilibrium at a given time.

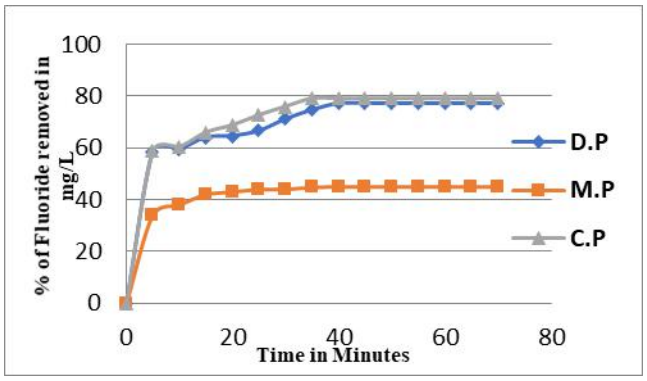

Fig.1. time spent in contact effect by removing fluoride Physically Carbon Activated

ADSORBENT DOSAGE EFFECT: The effect of dose of adsorbent is explored, and Figure.2 shows a graph of Fluoride removal percentage versus dosage. The amount of residual fluoride decreases substantially as the carbon dosage rises, reaching equilibrium as seen in the graph. The optimum dosage is the one that achieves the greatest amount of elimination.

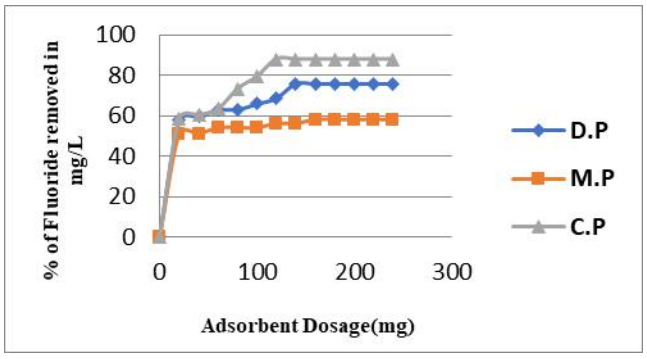

Fig.2. Fluoride elimination by Physically Activated Carbon is affected by contact dose.

THE PH EFFECT: The amount of adsorption that happens is directly proportional to the ph at which it occurs. the solution's pH level had an impact on the adsorption removal extent efficiencies Fluoride is produced via generated Figure 3 shows activated carbon at various pH levels.

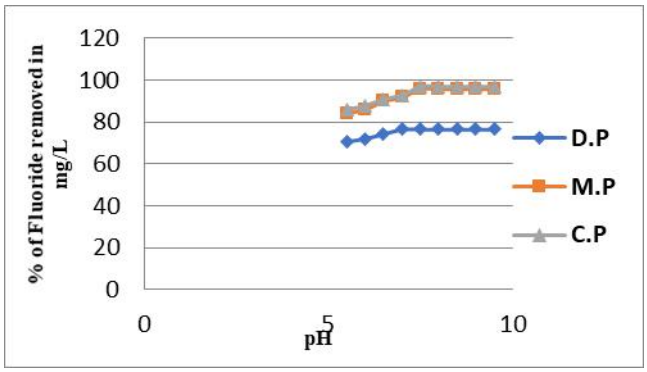

Fig.3., the pH effect on fluoride removal by Physically Activated Carbon

CONCLUSIONS

The following conclusions were drawn based on the experimental study:

For physical activated carbons, the optimum contact period is 40 minutes, 40 minutes and 35 minutes, with removal effectiveness of 77.5 percent and 45 percent and 78.96 percent, respectively.
According to the results of an adsorbent dosage optimization experiment, increasing the amount of adsorbent given enhances fluoride removal from the solution. Physical activated carbon dosages of 140 mg, 160 mg and 120 mg were shown to be optimal, with elimination efficiencies of 75.8 percent,58 percent and 87.99 percent, respectively.
Fluoride adsorption is primarily pH dependant. With a lower pH value, the adsorbent's removal effectiveness improves. For physical activated carbons, maximal adsorption occurred around pH 7.00, 7.50 and 7.50, with

removal effectiveness of 76.5 percent, 96.00 percent and 97.00 percent, respectively.

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