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Defluoridation of Water by Neem (*Azadirachta indica*) and Peepal (*Ficus religiosa*) Leaves as Carbon Adsorbent

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ABSTRACT

In the present work, neem leaves carbon/peepal leaves carbon were prepared by heating the leaves at 400°C in electric furnace was found to be useful for the removal of fluoride. The adsorbents of 0.4 mm sizes of neem/peepal leaves carbon were prepared by standard sieve. Batch experiments done to see the fluoride removal properties from ground water of 2 ppm to study the influence of pH, adsorbent dose and contact time on adsorption efficiency. The optimum pH was found to be pH 6.0 for both adsorbents. The optimum dose of ANC (activated neem leaves)/APC (activated peepal leaves) was found to be 1.0g/100ml. The optimum time was found greater than APC. This study suggests that the ANC is more effective adsorbent for removal of fluoride from drinking water than APC. There is no adverse change in the physiochemical properties of treated water. It is evident that fluoride removal reached a maximum of 50% and 39% by ANC and APC respectively at pH 6.0. Initially it was observed that the percent fluoride removal increases as the pH increase from 2.0 to 6.0. Therefore, solution pH was maintained at pH 6.0 for further studies. It is found that the removal of fluoride ions increases with increase in contact time, but after some time, it gradually approaches a constant value, denoting attainment of equilibrium. Further increase in contact time does not increase uptake due to deposition of fluoride ions on the available adsorption sites on adsorbent material. All optimized conditions were applied for removal of fluoride from groundwater samples.

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INTRODUCTION

1. The presence of fluoride, in quantities in excess of limits is a serious matter of concern from a public health point of view. Like any other pollutant the fluoride pollution can also occur due to both natural and manmade reasons. Fluoride in drinking water is known for both beneficial and detrimental effects on health. Fluoride is beneficial when present in concentration of 0.8-1.0 mg/l.
2. Indian standards for fluoride in drinking water were given by (Central Pollution Control Board, 1998) as 1.0 ppm¹.
3. World Health Organization (WHO) recommended that the fluoride content in drinking water should be in the range of 1.0-1.5 ppm.

OBJECTIVE

Our main objective is to study on removal of fluoride from ground water using neem and peepal leaves as an activated carbon².

LITERATURE REVIEW

1. Earlier studied on fluoride in drinking water and its removal³ revealed that excessive fluoride concentrations have been reported in groundwater's of more than 20 developed and developing countries including India where 19 states are facing acute fluorosis problems.
2. Previously studied on removal of fluoride by thermally activated carbon⁴ prepared from neem (*azadirachta indica*) and kikkar (*acacia Arabica*) leaves. In this study, neem leaves carbon and kikkar leaves carbon prepared by heating the leaves at 400°C in electric furnace was found to be useful for the removal of fluoride.
3. It has been studied on influence of other contaminants on removal of fluoride from ground water by adsorption⁵. Ground water from certain parts of India contains fluorides in much higher concentration, which can be toxic to the human beings and aquatic life. Adsorption is the best economic method to reduce the concentration.
4. The study conducted on removal of fluoride by thermally treated some earthen pots⁶ which were found to be useful for the removal of fluoride.

ACTIVATED CARBON METHOD

Various method of removal of fluoride in water:

1. Activated carbon
2. Florex

3. Lime
4. Precipitation
5. Adsorption and Ion-exchange
6. Membrane filtration process
7. Distillation

Flow Chart for Activated Carbon Method:

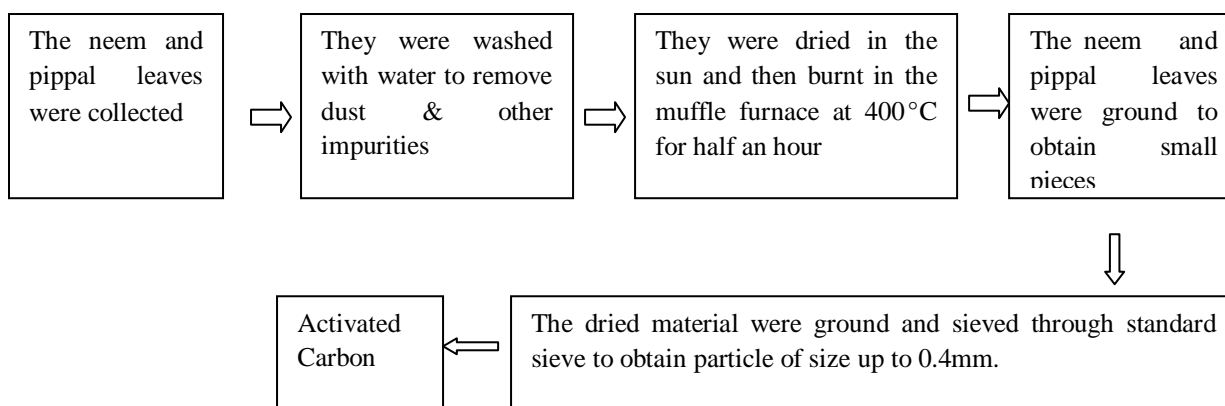


Table 1 : Effect of neem and Peepal adsorbent doses on fluoride removal

Initial fluoride concentration (ppm)	Doses (g/100ml)	Effect of doses on fluoride removal	
		Neem (ppm)	Peepal (ppm)
2.0	0.1	1.16	1.38
	0.2	1.12	1.35
	0.3	1.10	1.31
	0.4	1.06	1.28
	0.5	1.00	1.24
	0.6	0.98	1.18
	0.7	0.97	1.17
	0.8	0.94	1.13
	0.9	0.90	1.1

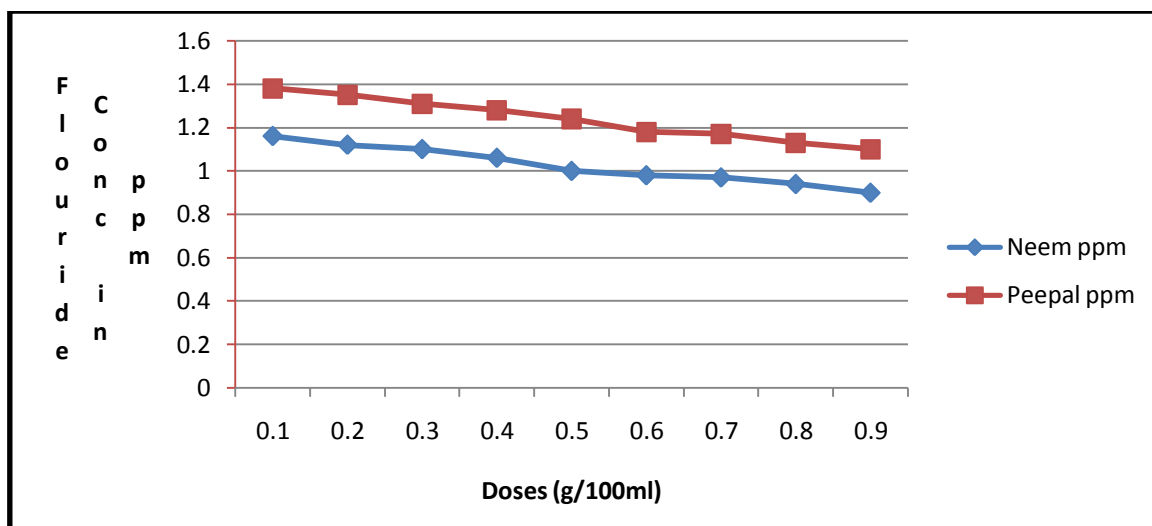


Table 2 : Effect of pH of neem and Peepal adsorbent doses on fluoride removal

Initial fluoride concentration (ppm)	pH	Fluoride concentration after treatment	
		Neem (ppm)	Peepal (ppm)
2.0	2	1.3	1.6
	4	1.2	1.5
	6	1.1	1.4
	8	1.3	1.6
	10	1.4	1.7

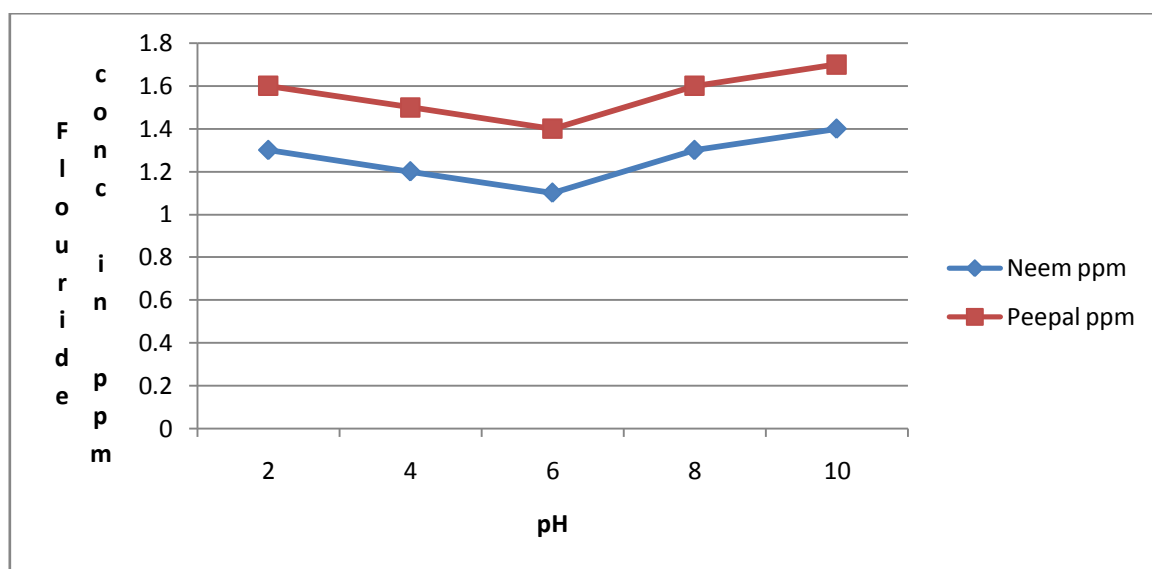
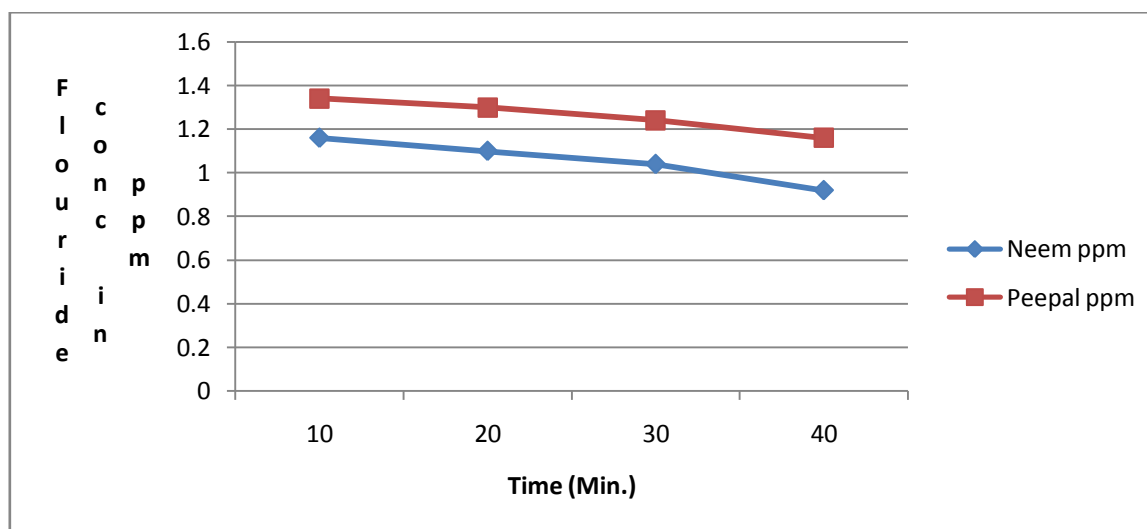


Table 3 : Effect of contact time of neem and Peepal adsorbent doses on fluoride removal

Initial fluoride concentration (ppm)	Time (min.)	Fluoride concentration after treatment	
		Neem (ppm)	Peepal (ppm)
2.0	10	1.16	1.34
	20	1.10	1.30
	30	1.04	1.24
	40	0.92	1.16
	50	0.82	1.06



CONCLUSIONS

The present study indicates that removal of fluoride from aqueous solution depends on pH, contact time and dose of the adsorbent. Removal efficiency of studied adsorbents is found $ANC > APC$ g/dose. This study suggests that the ANC is more effective adsorbent for removal of fluoride from drinking water. There is no adverse change in the physiochemical properties of treated water.

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