Chapter 3
Non–Metal Pollution (Fluoride)

ABSTRACT

In this chapter, the authors describe Fluoride contamination spread in the environment. Fluoride in groundwater is a serious problem. Groundwater is the most valuable fresh water used for drinking purposes in different areas. Irrigation is one primordial sector in India where one-third of land surface falls under arid and semi-arid climate, and rainfall is seasonal and erratic. Semi-arid climate prevailing in Tonk district necessitates the characterization of groundwater quality for optimizing its use in irrigation as well as in domestic consumption. The majority of underground water contains a high concentration of salts, and their continuous use adversely affects soil, animal, and plant health, and thereby crop production. The plant-based phytoremediation approach to improve the quality of water and soil has become an area of importance to study regarding Fluoride.

INTRODUCTION

This chapter addresses about fluoride (F) in the soil, human being and plant parts affected when increased to a large extent with increasing fluoride concentration. Fluoride is as one of the most important environmental pollutant problems is responsible for soil and groundwater pollution causing dental and skeletal fulorosis and still no cure yet. The environment can largely be affected by the increase concentration of fluoride. Fluoride is one of the most important environmental macro pollutants responsible for the soil and groundwater pollution causing dental and skeletal fulorosis (Agarwal et al., 1997). Fluoride

(F) toxicity is a great cause of the concern in different lands, where it is found in high amount in the ground water. Elevated concentrations of fluoride in groundwater are responsible for serious health problem in many parts of the world. Worldwide, (Figure 1) more than 200 million people (including 70 million in India and 45 million in China) from 28 tropical countries are at the risk from dental, skeletal non-skeletal endemic fluorosis (Figure 2), i.e. the sign of fluoride poisoning (Yang et al., 2003). Fluoride pollution spread all over the world, India is severely suffering from its effects (Meenakshi and Maeshwari, 2006). Researchers investigate that F concentration in drinking water present at high amount has been found in Mexico, Holland, Itlay and Spain in South and North American countries (Mella et al., 1994). India has been critically affected by high F concentration and 17 out of 32 states were severely contaminated areas especially in Rajasthan (Vikas et al., 2013). In India, about 20% of F concentration were found in the household water supply; out of these 10% was only found in Rajasthan (Hussain et al. 2010). According to Saini et al. (2013) total F content in soil was higher level than normal ones KVK farm ($127.56\,\mu g\,g^{-1}$) and Banasthali ($679.63\,\mu g\,g^{-1}$). Fluoride concentration as high as 86 mgl^{-1} has been reported from Motipura village of Haryana, India (Garg et al., 2009). Application of fluoride-contaminated groundwater for the irrigation is common in many fluoride endemic areas, which can affect the crops considerably.

Fluoride is absorbed by plant roots and then transported via xylematic flow to different parts of the plant (Pant et al., 2008), where it can get accumulated. The effect of fluoride on germination, physiological and biochemical parameters in different plant species have been studied by many workers. These studies revealed that display to elevated fluoride can cause decreased germination, retarded plant growth (Miller et al., 1999), chlorosis (Mcnulty and Newman, 1961) and leaf necrosis (Elloumi et al., 2005). However, in fluorosis endemic areas, the fluoride content in plant parts have shown higher concentrations (Gupta et al., 2009). The risk for human health and the environment can largely be effected by the concentration of fluoride that occurs in groundwater and the rate by which fluoride transfer to groundwater as both these processes can be strongly persuade by the interaction of dissolved fluoride, with the soil solid phase via adsorption and desorption (Daniel et al., 1985). F- Present in soil is bound in complexes and is usually transported through the water cycle; F was estimated using Fluoride Ion Selective Electrode with TISAB (Rai et al., 2000).

11 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/non-metal-pollution-fluoride/241166

Related Content

Climate Change Education through Art and Science Collaborations
Phillip Gough, Kate Dunnand Caitilin de Bérigny (2016). *Promoting Climate Change Awareness through Environmental Education (pp. 16-36).*
www.irma-international.org/chapter/climate-change-education-through-art-and-science-collaborations/138149

Modelling the Frequency of Tropical Cyclones in the Lower Caribbean Region
Reynold J. Stone (2017). *Environmental Sustainability and Climate Change Adaptation Strategies (pp. 341-349).*
www.irma-international.org/chapter/modelling-the-frequency-of-tropical-cyclones-in-the-lower-caribbean-region/170320

Residual Analysis of Pesticides in Surface Water of Nagpur, India: An Approach to Water Pollution Control
Binota Thokchomand Neeta Thacker (2019). *Handbook of Research on the Adverse Effects of Pesticide Pollution in Aquatic Ecosystems (pp. 280-300).*
www.irma-international.org/chapter/residual-analysis-of-pesticides-in-surface-water-of-nagpur-india/213511

Improvement of the Calculation of the Closed Collector-Drainage Network of Drainage Systems
Liubov Volkand Maksym Haponiuk (2023). *Handbook of Research on Improving the Natural and Ecological Conditions of the Polesie Zone (pp. 209-221).*
www.irma-international.org/chapter/improvement-of-the-calculation-of-the-closed-collector-drainage-network-of-drainage-systems/324040

New Computational Models for Image Remote Sensing and Big Data
Dhanasekaran K. Pillai (2019). *Environmental Information Systems: Concepts, Methodologies, Tools, and Applications (pp. 232-248).*
www.irma-international.org/chapter/new-computational-models-for-image-remote-sensing-and-big-data/212946