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Ecological risk assessment of trace elements (TEs) pollution and human health risk exposure in agricultural soils used for saffron cultivation

Mahmoud Taghavi[1], Mostafa Darvishiyan[2], Maryam Momeni[2], Hadi Eslami[3], Reza Ali Fallahzadeh[4] & Ahmad Zarei[5]✉

Contamination of farmland soils by trace elements (TEs) has become an international issue concerning food safety and human health risks. In the present research, the concentrations of TEs including cadmium (Cd), cobalt (Co), chromium (Cr), copper (Cu), manganese (Mn), nickel (Ni), lead (Pb), zinc (Zn) and iron (Fe) in soils of 16 farmlands were determined in Gonabad, Iran. In addition, the human health risks due to exposure to the TEs from the soils were assessed. Moreover, the soil contamination likelihood was evaluated based on various contamination indices including contamination factor (CF), enrichment factor (EF), geo-accumulation index (Igeo), and pollution load index (PLI) calculations. The soil mean concentrations for Cd, Co, Cr, Cu, Mn, Ni, Pb, Zn and Fe ranges as 0.102, 6.968, 22.550, 29.263, 475.281, 34.234, 13.617, 54.482 and 19,683.6 mg/kg in farmland soils. The mean concentrations of the TEs decreased in the order of Fe > Mn > Zn > Ni > Cu > Cr > Pb > Co > As > Cd. Levels of all metals in this study were within the FAO/WHO and Iranian soil standards. The HQ values from investigated elements for adults and children in the studied farms were less than the limit of 1, indicating no health risks for the studied subpopulations. The results of the present research indicated no significant carcinogenic health hazards for both adults and children through ingestion, skin contact and inhalation exposure routes. CF values of Ni and Zn in 100% and 6.25% of farmlands were above 1, showing moderate contamination conditions. EF values of metals in farmlands were recorded as "no enrichment", "minimal enrichment" and "moderate enrichment" classes. Furthermore, it can be concluded that the all farms were uncontaminated except Ni (moderately contaminated) based on Igeo. This is an indication that the selected TEs in the agricultural soils have no appreciable threat to human health.

Issues arise from the rapid process of urbanization, industrialization and land use has attracted worldwide public attention from both environmental and health perspectives[1,2]. Soil is the skin of our globe and is necessary for living organisms as it provides elements and nutrients for plants growth and serves as habitat for microflora and fauna[3]. The growing population in world significantly increase pressure on the farmlands. In order to improve the yield and profit of agricultural products, the excessive cultivation has inevitably resulted in the contamination of the soils by TEs. Farming is considered to be one of the main sources of As, Cu, Zn, Fe and Pb in the soils[4–7]. Among toxic and persistent pollutants found in agricultural soils, a special attention is paid on heavy metals. Heavy metals (including both metals and metalloids) are the most widely distributed elements of concern in

[1]Department of Environment Health Engineering, School of Health, Social Determinates of Health Research Center, Gonabad University of Medical Sciences, Gonabad, Iran. [2]Student Research Committee, Gonabad University of Medical Sciences, Gonabad, Iran. [3]Department of Environmental Health Engineering, School of Health, Occupational Safety and Health Research Center, NICICO, World Safety Organization and Rafsanjan University of Medical Sciences, Rafsanjan, Iran. [4]Genetic and Environmental Adventures Research Center, School of Abarkouh Paramedicine, Shahid Sadoughi University of Medical Sciences, Yazd, Iran. [5]Department of Environment Health Engineering, School of Health, Infectious Diseases Research Center, Gonabad University of Medical Sciences, Gonabad, Iran. ✉email: a.zarei.bums@gmail.com

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Ecological Risk Evaluation Of Polluted Soils

JR Anderson

Ecological Risk Evaluation Of Polluted Soils:

Ecological Risk Evaluation of Polluted Soils Jean-Louis Riviére,2000 This work presents an holistic view of the fundamental principles and practicable methods of polluted soils A set of definitions is presented and different aspects of the evolution of pollutants and their toxicity are developed Environmental Risk Assessment of Soil Contamination Maria C. Hernandez Soriano,2014-03-26 Soil is an irreplaceable resource that sustains life on the planet challenged by food and energy demands of an increasing population Therefore soil contamination constitutes a critical issue to be addressed if we are to secure the life quality of present and future generations Integrated efforts from researchers and policy makers are required to develop sound risk assessment procedures remediation strategies and sustainable soil management policies Environmental Risk Assessment of Soil Contamination provides a wide depiction of current research in soil contamination and risk assessment encompassing reviews and case studies on soil pollution by heavy metals and organic pollutants The book introduces several innovative approaches for soil remediation and risk assessment including advances in phytoremediation and implementation of metabolomics in soil sciences Ecological Risk Assessment of Contaminants in Soil N.M. Van Straalen,Hans Løkke,2012-12-06 Many industrialized and developing countries are faced with the assessment of potential risks associated with contaminated land A variety of human activities have left their impacts on soils in the form of elevated and locally high concentrations of potential toxicants In several cases sources have not yet been stopped and contamination continues Decisions on the management of contaminated sites and on the regulation of chemicals in the terrestrial environment require information on the extent to which toxicants adversely affect the life support function of soils Ecological insights into the soil as an ecosystem may support such decisions This book reviews the latest ecological principles that should be considered in this respect Ecological Risk Assessment for Contaminated Sites Glenn W. Suter II,Rebecca A. Efroymson,Bradley E. Sample,Daniel S. Jones,2000-04-21 Love Canal Exxon Valdez Times Beach Sacramento River Spill Amoco Cadiz Seveso Every area of the world has been affected by improper waste disposal and chemical spills Common hazardous waste sites include abandoned warehouses manufacturing facilities processing plants and landfills These sites poison the land and contaminate groundwater and drinking water A sequel to the bestselling Ecological Risk Assessment Ecological Risk Assessment for Contaminated Sites focuses on how to perform ecological risk assessments for Superfund sites and locations contaminated by improper disposal of wastes or chemical spills It integrates the authors extensive experience in assessing ecological risks at U S government sites with techniques and examples from assessments performed by others Conducting an ecological risk assessment on a contaminated site provides the information needed to make decisions concerning site remediation The first rule of good risk assessment is don t do anything stupid With the practical preparation you get from Ecological Risk Assessment for Contaminated Sites you won t **Ecological Risk Assessment of Contaminants in Soil** Nico M. van Straalen,Hans Løkke,1997-05-31 Many industrialized and developing

countries are faced with the assessment of potential risks associated with contaminated land A variety of human activities have left their impacts on soils in the form of elevated and locally high concentrations of potential toxicants In several cases sources have not yet been stopped and contamination continues Decisions on the management of contaminated sites and on the regulation of chemicals in the terrestrial environment require information on the extent to which toxicants adversely affect the life support function of soils Ecological insights into the soil as an ecosystem may support such decisions This book reviews the latest ecological principles that should be considered in this respect **Core List for an Environmental Reference Collection** ,2002 *Remediation and Health Risks of Heavy Metal Contaminated Soils* Qi Liao,Mariusz Gusiatin,Weichun Yang,2024-10-18 Soil is the essential foundation for human survival However soil pollution and environmental problems have become increasingly evident in recent years In particular heavy metal pollution at various sites poses a serious threat to human health and ecological safety becoming a significant social issue worldwide Greener and environmentally friendly remediation technologies coupled with accurate evaluation of the potential risks environmental impact and human health of heavy metals in the soil have become urgently required This Research Topic aims to gather the latest advancements in scientific research and applicable studies on i the potential risk or impact of recently problematic heavy metals such as Sb TI and cases of combined heavy metal pollution ii pollution formation migration and remediation of heavy metal in soil and groundwater iii novel methods to treat and reduce heavy metals in contaminated sites iv environmentally friendly remediation technology such as enhanced bioremediation and in situ remediation and v assessment or modeling of the environmental or human health impact of heavy metals *Human and Ecological Risk Assessment* Dennis J. Paustenbach,2024-04-15 Understand the fundamentals of human risk assessment with this introduction and reference Human risk assessments are a precondition for virtually all industrial action or environmental regulation all the more essential in a world where chemical and environmental hazards are becoming more abundant These documents catalog potential environmental toxicological ecological or other harms resulting from a particular hazard from chemical spills to construction projects to dangerous workplaces They turn on a number of variables of which the most significant is the degree of human exposure to the hazardous agent or process Human and Ecological Risk Assessment combines the virtues of a textbook and reference work to introduce and analyze these vital documents Beginning with the foundational theory of human health risk assessment it then supplies case studies and detailed analysis illustrating the practice of producing risk assessment documents Fully updated and authored by leading authorities in the field the result is an indispensable work Readers of the second edition of Human and Ecological Risk Assessment will also find Over 40 entirely new case studies reflecting the latest in risk assessment practice Detailed discussion of hazards including air emissions contaminated food and soil hazardous waste sites and many more Case studies from multiple countries to reflect diverse international standards Human and Ecological Risk Assessment is ideal for professionals and advanced graduate students in toxicology industrial

hygiene occupational medicine environmental science and all related subjects Soil and sediment pollution, processes and remediation, volume II Jun Zhou,Hongbiao Cui,Zhu Li,Chunhao Gu,Buyun Du,2023-02-09 **Superfund Risk Assessment in Soil Contamination Studies** Keith B. Hoddinott,1992 Proceedings of an ASTM symposium held in New Orleans in January 1991 Papers were selected in the categories of site characterization fate and transport toxicity exposures and receptors risk characterization and case studies and establishing cleanup levels The authors discuss the current modi

Environmental Risk Assessment Diana Mariana Cocârță,2023-08-22 Environmental Risk Assessment familiarizes readers with risk assessment for the main environmental systems that are surveyed soil water and air The text aims to enable learners to develop knowledge and awareness about environmental risk management and take action to transform society into a sustainable one The eight edited chapters start with an introduction to the subject and an outline of good practices in risk assessment The latter half presents a risk based approach to the environment and provides a deep dive into risk management implementation for contaminated sites monitoring air quality evaluating drinking water for safety and risk analysis in waste management Concepts are explained in simple language with references included for further reading This book is an essential guideline for students who require knowledge of risk assessment in environmental engineering programs or related course modules **Environmental Crisis: Pollution and Governance** Dongfei Han,Mukesh Khare,Siyue Li,2025-08-04 This book presents cutting edge research findings on environmental pollution and remediation covering key areas such as pollution analysis and monitoring as well as pollution control and restoration At the 2024 UN Environment Assembly environmental pollution and remediation were once again defined as one of the three major crises facing the planet The global environmental pollution issue remains severe despite the efforts of many countries and regions the situation is still far from optimistic Issues such as heavy metals and radioactive contamination in seawater are gradually becoming significant topics in environmental pollution Accurate composition analysis and effective remediation strategies are essential in addressing pollution and enhancing the accuracy of pollutant source analysis and the effectiveness of harmless pollution management are key subjects of discussion in this book Furthermore the book aims to facilitate the exchange of scientific information among scholars from leading universities research centers and high tech enterprises around the world This book will be highly beneficial to scholars engineers and researchers in the fields of environmental engineering and environmental remediation Soil and Groundwater Remediation Technologies Yong Sik Ok,Jörg Rinklebe,Deyi Hou,Daniel C.W. Tsang,Filip M.G. Tack,2020-03-23 This book offers various soil and water treatment technologies due to increasing global soil and water pollution In many countries the management of contaminated land has matured and it is developing in many others Topics covered include chemical and ecological risk assessment of contaminated sites phytomanagement of contaminants arsenic removal selection and technology diffusion technologies and socio environmental management post remediation long term management soil and groundwater laws and regulations and trace element regulation limits in soil

Future prospects of soil and groundwater remediation are critically discussed in this book Hence readers will learn to understand the future prospects of soil and groundwater contaminants and remediation measures Key Features Discusses conventional and novel aspects of soil and groundwater remediation technologies Includes new monitoring sensing technologies for soil and groundwater pollution Features a case study of remediation of contaminated sites in the old industrial Ruhr area in Germany Highlights soil washing soil flushing and stabilization solidification Presents information on emerging contaminants that exhibit new challenges This book is designed for undergraduate and graduate courses and can be used as a handbook for researchers policy makers and local governmental institutes Soil and Groundwater Remediation Technologies A Practical Guide is written by a team of leading global experts in the field Environmental Analysis of Contaminated Sites Geoffrey I. Sunahara,Agnès Y. Renoux,Claude Thellen,Connie L. Gaudet,Adrien Pilon,2002-03-12 Die Bioremediation ist ein Verfahren bei dem biologische Verfahren eingesetzt werden um industrielle Schadstoffe in verschiedenen kosystemen wieder in den nat rlichen Stoffkreislauf zur ckzuf hren Ob die Bioremediation erfolgreich ist oder nicht h ngt entscheidend vom Verst ndnis des biotechnologischen Prozesses und von den St rken und Schw chen der eingesetzten kotoxikologischen Verfahren ab Environmental Analysis of Contaminated Sites diskutiert umweltanalytische Verfahren und Methoden zur Bewertung der erfolgreichen Sanierung kontaminierter Bodensysteme Ein n tzlicher Leitfaden der diese komplexe Thematik umfassend behandelt indem er kotoxizit tstests f r den Bodenschutz die Bioremediation und die Risikobewertung der Umweltgef hrdung miteinander verbindet Dar ber hinaus beschreibt er das Zusammenwirken von kotoxikologischer Labor und Felduntersuchung Biotechnologie Consultants und verschiedenen internationalen Umweltkontrollbeh rden und erkl rt wie sie gemeinsam an einer erfolgreichen Auswertung sanierter Umweltsysteme arbeiten Mit zahlreichen Fallstudien zu erfolgreichen und gescheiterten Projekten **Recent Researches in Earth and Environmental Sciences** Yaseen T. Mustafa,Sattar Sadkhan,Subhi Zebari,Karwan Jacksi,2019-06-21 This book includes the papers presented in International Conference on Advanced Science and Engineering 2019 ICOASE2019 which held in Duhok Kurdistan Region Iraq on April 2 4 2019 The conference is organized by both the University of Zakho and Duhok Polytechnic University The conference and consequently these proceedings aimed to give more concrete expression to the natural sciences and engineering applications with a new multilateral scientific forum that emphasizes the vulnerability and proactive remediation from an Earth and Environmental point of view This book covers a wide range of questions and gives advanced themes on current research focusing on emerging environmental issues and challenges in chemistry biology physics and related areas in geoscience with their applications Assessments And Remediation Of Oil Contaminated Soils Paul Kostecki,1999 Paul T Kostecki Associate Director Northeast Regional Environment Public Health Center School Of Public Health University Of Massachusetts At Amherst Received His Ph D From The School Of Natural Resources At The University Of Michigan In 1 980 He Has Been Involved With Human And Ecological Risk Assessment And Risk Management

Research For The Last 12 Years Dr Kostecki Has Co Authored And Co Edited Over 50 Articles And 16 Books On Environmental Assessment And Cleanup Including Remedial Technologies For Leaking Underground Storage Tanks Soils Contaminated By Petroleum Products Petroleum Contaminated Soils Vols 1 To 3 Hydrocarbon Contaminated Soils And Groundwater Vols 1 To 4 Hydrocarbon Contaminated Soils Vols 1 To 5 Principles And Practices For Diesel Contaminated Soils Vols 1 To 5 Sesoil In Environmental Fate And Risk Modeling Contaminated Soils Vol 1 And Risk Assessment And Environmental Fate Methodologies Dr Kostecki Also Serves As Associate Editor For The Journal Of Soil Contamination Chairman Of The Scientific Advisory Board For Soil And Groundwater Cleanup Magazine As Well As An Editorial Board Member For The Journal Of Human And Ecological Risk Assessment In A Addition Dr Kostecki Serves As Executive Director For The Association For The Environmental Health Of Soils Aehs And Was The Scientific Advisor For The Workshop On Assessment And Remediation Of Oil Contaminated Soils Held In Kuwait 18 22 March 1995 Dr Manaf Behbehani Obtained His B S In Biology From The University Of Akron Usa 1969 And M S In Zoology From The Same University 1972 He Continued His Graduate Studies At The University Of New Hampshire Receiving Ph D In Marine Ecology And Invertebrates In 1978 Since Then He Has Been Teaching Ecology And Marine Biology Courses At The Faculty Of Science Kuwait University From 1 982 1987 He Held The Post Of Marine Scientist At The Regional Organisation For The Protection Of The Marine Environment Ropme In Kuwait Dr Behbehani Has Worked On A Number Of Pioneering Research Projects Namely To Study The Zooplankton Of Kuwaiti Waters And The Western Section Of The Arabian Gulf And To Study The Distribution Abundance And Taxonomy Of Marine Invertebrates Living In The Intertidal Zones Of Kuwait He Has Published Several Scientific Articles And Has Served As External Examiner For Several Masters Thesis From 1991 1995 Dr Behbehani Was Vice Dean For Planning And Laboratories At The Faculty Of Science Kuwait University And Is Presently Chairman Of The National Biodiversity Committee State Of Kuwait He Was The Chairman Of The Scientific Committee For The Workshop On Assessment And Remediation Of Oil Contaminated Soils The Proceedings Of Which Are Published In This Book **Management of Contaminated Site Problems, Second Edition** Kofi Asante-Duah,2019-04-12 This book outlines the strategies used in the investigation characterization management and restoration and remediation for various contaminated sites It draws on real world examples from across the globe to illustrate remediation techniques and discusses their applicability It provides guidance for the successful corrective action assessment and response programs for any type of contaminated land problem and at any location The systematic protocols presented will aid environmental professionals in managing contaminated land and associated problems more efficiently This new edition adds twelve new chapters and is fully updated and expanded throughout Heavy Metal Toxicity: Environmental Concerns, Remediation and Opportunities Rajeev Pratap Singh,Pooja Singh,Amrita Srivastava,2023-09-22 This contributed volume covers a comprehensive account of the sources toxic biological as well as environmental impacts and possible remediation strategies for contamination by heavy metals In biological

systems toxic metals affect the integrity of cellular organelles and act as carcinogens causing chromosomal aberrations or as systemic toxicants leading to cardiovascular neurobehavioral and immunological disorders In plants they interfere with photosynthesis fertility metabolite and chlorophyll synthesis Toxicity induced by heavy metals involves mechanistic approaches that need to be understood properly They cannot be degraded by biological or chemical means and thus can only be converted to less harmful forms The conventional detection methods include biosensors voltammetry atomic absorption spectrometry and inductively coupled plasma with atomic emission spectrometry All such strategies for metal detection and mitigation strategies are covered in this title under one section This book incorporates classical views along with modern scientific approaches to develop an understanding of the subject matter suitable for academicians researchers planners policymakers NGOs and environmental consultancies and raise awareness on this concern Topics representing diverse sections namely environmental impacts biological effects and methods used for detection and remediation have been included to address all possible contemporary issues on the topic in one concise volume **Emerging Organic Contaminants in Soil** Ming Zhang,Mahtab Ahmad,2025-09-30 Emerging organic contaminants EOCs are either newly identified or newly detected contaminants that are toxic or potentially hazardous to the ecosystem The EOCs include but are not limited to pharmaceuticals and personal care products PPCPs antibiotics perfluoroalkyl sulfonate PFAS flame retardants endocrine disruptors etc presenting new challenges for scientists policymakers and the public Soil is one of the most important sinks of EOCs arising from industrial emissions incidental discharge wastewater irrigation or atmospheric deposition The presence of EOCs in soil may threaten the soil ecosystem s health and subsequently transfer to humans via food and water consumption This book provides comprehensive knowledge on the behavior and translocation of EOCs in soil and the related environmental medium and introduces remediation methods and technologies From fundamentals to future risks it explains the importance of understanding EOCs Features Provides a comprehensive overview of EOCs in environmental systems Covers comprehensively the physical chemical and biological processes of EOCs in soil Addresses innovative remediation and management approaches of EOC contaminated sites Is the first well organized book on EOC written by international experts with long engagement in EOC studies This book is an excellent foundational text for upper level undergraduate and graduate students taking courses in soil science environmental science environmental chemistry social ecology and waste management It is also essential for those who work with environmental hazards such as environmental engineers ecologists environmental professionals and managers *Heavy Metals in the Environment* Vinod Kumar,Anket Sharma,Artemi Cerda,2020-11-21 Heavy Metals in the Environment Impact Assessment and Remediation synthesizes both fundamental concepts of heavy metal pollutants and state of the art techniques and technologies for assessment and remediation The book discusses the sources origin and health risk assessment of heavy metals as well as the application of GIS remote sensing and multivariate techniques in the assessment of heavy metals The various contamination

indices like contamination factor geoaccumulation index enrichment factor and pollution index ecological risk index are also included to provide further context on the state of heavy metals in the environment Covering a variety of approaches techniques and scenarios this book is a key resource for environmental scientists and policymakers working to address environmental pollutants Covers state of the art techniques for the assessment and remediation of heavy metals Presents the interdisciplinary impacts of heavy metals including human health ecosystems and water quality Includes various contamination indices such as contamination factor geoaccumulation index enrichment factor pollution index and ecological risk index

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