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1.	Dr. Akash Deep Sharma	Basic Instrumentation Skills	Dinesh Publications, ISBN: 9788193897171	2018
2.	Dr. Akash Deep Sharma	Physics Workshop Skills	Dinesh Publications, ISBN: 9789388796514	2019
3.	Mr. Sidharth	Weather Forcasting for B.Sc. III	Modern Publishers	2020
4.	Dr. Akash Deep Sharma	Renewable Energy and Energy Harvesting	R.D. Publications	2020

The list of the faculty members who have published chapters in books is as follows:

Sr. No.	Name of the faculty member	Title of the chapter	Title of the book	Year
1.	Dr Manoj Kumar	Role of fish biomarkers in aquatic environmental health assessment	In Recent Developments in Science and Technology .	2021
2.	Dr. Manoj Kumar	Biochar as an Emerging Amendment for Remediation of Heavy Metals-Contaminated Soil	Microbial and Biotechnological Interventions in Bioremediation and Phytoremediation	2022

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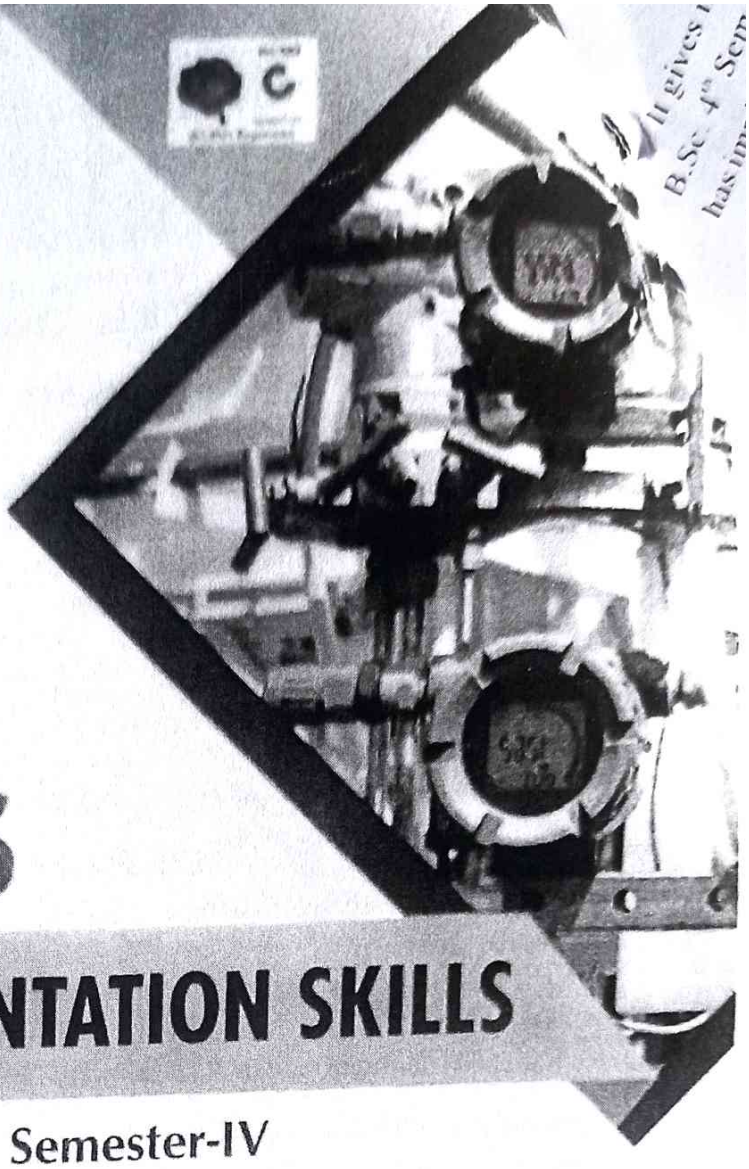

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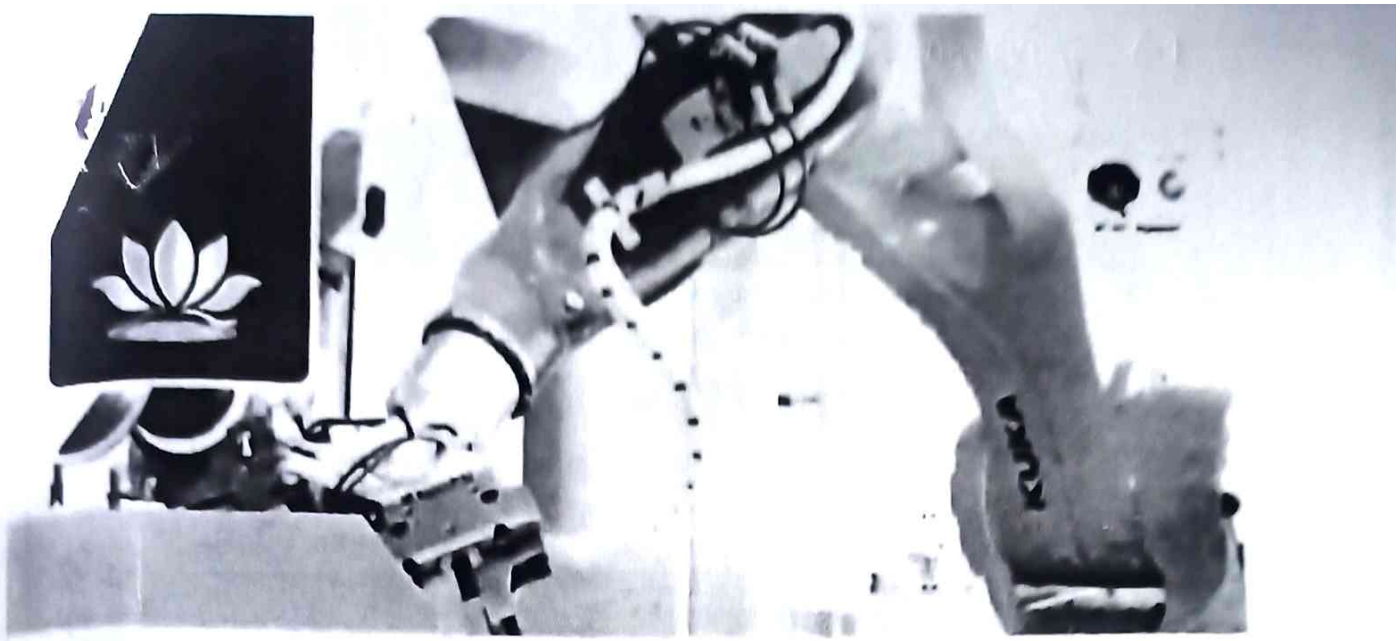

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ROLE OF FISH BIOMARKERS IN AQUATIC ENVIRONMENTAL HEALTH ASSESSMENT.

Sakshi Verma
Jalandhar.
Smriti Batoye
Baddi.
Manoj Kumar
Chamba.

ABSTRACT

Aquatic pollution being one of the global environmental concerns has triggered the establishment and use of biomarkers in environmental monitoring and risk assessment programmes. Wide arrays of biomarkers are used to demonstrate exposure to and effects of contaminants on aquatic organisms. Fish biomarkers, due to their high sensitivity towards the minute changes in ambient aquatic environment, are applied to elucidate the spectrum of effects and mechanisms underlying the toxicity of even low concentration of contaminants. This review outlines the integrated approach of various fish biomarkers, ranging from cellular to physiological along with behavioural responses, which have been proven to be useful in bio-monitoring of aquatic environment.

INTRODUCTION

During the recent decades, contamination of water bodies has increased enormously worldwide as a consequence of anthropogenic activities including industrial and agricultural. Myriad of complex chemical mixtures find their way into the aquatic environment either due to surface run off or direct disposal.[1] Thus water pollution is an essential issue which requires ongoing evaluation and revision. The aquatic population and community responses towards the pollutants are considered to be indicative of ecosystem health. But these responses are only manifested when a considerable damage to the environment has already occurred. Additionally, it has been documented that environmental pollution risk assessment cannot be exclusively based on chemical analysis as it does not manifest toxic effects of the pollutant on the aquatic organisms.[2] Therefore, the toxicological assessment of water contamination through sublethal bioassays becomes relevant as they allow the detection of adverse effects of pollutants on particular test organisms.[3] In general the early warning signals also known as biomarkers, such as responses at lower biological organization, are considered to be more specific, sensitive, reproducible and easier to determine, thus can be related to ecological changes.[4] A biomarker is defined as a change in a biological response (ranging from molecular through cellular and physiological responses to behavioural changes) which can be related to exposure to or toxic effects of environmental chemicals.[5] The use of biological responses in sentinel species upon exposure to contaminants has become a useful tool in monitoring environmental quality and risk assessment.[6] Since, biomarkers implicate early warning signals of environmental disturbances; these are considered as valuable tools and increasingly incorporated into environmental monitoring programs such as Joint Monitoring Program of the OSPAR convention, UNEP Mediterranean Biomonitoring Program etc.[7,8] Biomarkers are considered to be short-term indicators of long-term adverse effects and the data may permit intervention before the commencement of irreversible detrimental effects.

Among aquatic organisms, fish has been used as sentinel organisms for assessing early warning response to long-term ecological damage. Laboratory bioassays on fish ease in data interpretation and corroborate their responses as a monitoring index.[9,10] Fish can be found almost everywhere in the aquatic environment and they are involved in the aquatic food-webs on account of their function as a carrier of energy from lower to higher trophic levels. Additionally, fish exhibit large similarity with other vertebrates and many biological functions are conserved between fish species and humans, hence, fish has attracted scientific interest towards its application as model in human disease and development.[11] Accordingly, fish

Chapter 19
Biochar as an Emerging Amendment for Remediation of Heavy Metals-Contaminated Soil

Sakshi Verma, Manoj Kumar, and Nitika Kapoor

Abstract Biochar has become centre of attention in the recent years, for its potential role in improving soil health and agricultural productivity, carbon sequestration and also to mitigate global warming thereby providing a valuable remedy for agricultural and environmental issues. Biochar is carbon-rich material obtained by heating any organic matter in a closed container under absence or limited supply of oxygen. It is often prepared from a variety of feedstocks under different pyrolysis conditions, thus affecting the properties of biochar. Consequently, the effectiveness of biochar as an amendment of soil contaminated varies. It is increasingly being documented that biochar plays significant role in reducing the bioavailability, hence biotransformation and bioremediation of heavy metals in contaminated soil. Recently, the accelerating urbanization and rapid advancements in the agricultural and industrial technologies have led to escalation in contamination of soil particularly with heavy metals, thereby causing serious health issues and ecological risks. Biochar has been widely recognized as a promising material to effectively immobilize heavy metals in contaminated soil. This chapter describes the overview on soil contamination by heavy metals, different methods of biochar production, characteristics and the factors affecting the properties of biochar, the interaction of biochar with soil microbes, plants and heavy metals, and the potential role of biochar in phytoremediation and microbial remediation of heavy metal-contaminated soils. Besides, the possible limitations of biochar such as release of toxic substances, activation of certain heavy metals and difficulty in weed control in biochar-amended soil are also discussed. Some key areas related to the potential unintended effects of biochar need to be addressed so as to channelize the research in ensuring the sustainable use of biochar.

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