Udai Pratap Autonomous College, Varanasi

3.4.4 Proof of Books/Chapters in Book

Session: 2018-19 to 2022-23

We are pleased to present this book entitled **"Impact of Climate Change and Abiotic Stresses on Agriculture and Management Strategies"**. Ratnesh Kumar Rao, Secretary, Mahima Research Foundation and Social Welfare are not new to Agriculture students. With his vast experience in Academic activities, he has dealt this complex subject and edited, with practical approach and simple language, to meet the requirement of the students and teachers of Agriculture.

The New Vision for Agriculture initiative, led by the Consumer Industries Community of the World Economic Forum, works to develop a shared agenda for action and foster multi-stakeholder collaboration to achieve sustainable agricultural growth through market-based solutions. The initiative has defined a vision that highlights agriculture's potential as a positive driver of food security, environmental sustainability and economic opportunity worldwide. The group believes that achieving this vision will require the leadership and capacity of all stakeholders–government, business, civil society, academia, farmers and consumers.

The large gap between potential and current crop yields makes increased food production attainable. India's low agricultural productivity has many causes, including scarce and scant knowledge of improved practices, low use of improved seed, low fertilizer use, inadequate irrigation, conflict, absence of strong institutions, ineffective policies, lack of incentives, and prevalence of diseases. Climate change could substantially reduce yields from rainfed agriculture in some countries. With scarcity of land, water, energy, and other natural resources, meeting the demands for food and fiber will require increases in productivity.

Though this book is mainly deals with the agriculture research and education, it will also be very handy for those who desire to start Agricultural Research in Food security.

We are sure this will be accepted very much by the students, teachers, scientists and Stakeholders of Agriculture all over the India. We solicit your encouragement in this endeavour.

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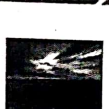

Chief Editor
Ratnesh Kumar Rao

NEGATIVE EFFECTS OF LEAD ACETATE ON THE BEHAVIOUR OF FRESHWATER CATFISH, *Heteropneustes fossilis* (Bloch.)

Ashvani Kumar Srivastav[1] and Sanjay Kumar Srivastava[2]

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Environmental pollutants such as metals, pesticides and other organic chemicals pose serious risks to many aquatic organisms. Accordingly a great deal of previous research has characterized physiological mechanisms of toxicity in animals exposed to contaminants. Lead is a non essential highly toxic metal widely distributed in environment. It escapes into the environment during smelting of its sulphide ore galena as well as from storage batteries, pipes, etc. A certain amount of contamination of food and domestic water results from the use of lead ceramics, china glass and porcelain enamels in food processing equipments and kitchenware. Some foods, dyes and cosmetics contain lead compounds as artificial coloring agents. It is also discharged with water from lead mines, lead refining storage battery as well as plants for manufacture of tetra ethyl lead.

Pesticides usage in agricultural fields to control pests is extremely toxic to non target organism like fish and affect fish health through impairment of metabolism, sometimes leading to mortality. In recent years, the high rate of increase in human population and rapid pace of industrialization have created problem of disposal of waste waters. The domestic wastes and untreated or partially treated industrial effluents, supplemented with pollutants like heavy metals, pesticides and many organic compounds, have greatly contributed to massive fish death of aquatic ecosystems. These toxic chemicals and metals have changed the quality of water that affects the fish and other aquatic organisms.

Lead Acetate Toxicity and its Behaviour: Lead is a non essential highly toxic metal widely distributed in environment. An experiment was carried out to determine the acute toxicity of lead acetate on freshwater catfish, *Heteropneustes fossilis* for different time intervals viz; 1h, 3h, 5h, 24h, 48h, 72h and 96h. In experiment pure form of lead acetate were used. Pure diluted form of lead acetate dissolved in water and observed the behavior of fish. The behavioural responses of fish on exposure to lead acetate included erratic movement, hyperexcitability and restnessness. In the present study, fish exhibited frequently jumping, secretion of excess mucous from the gills and the body. The fish appeared excited with a rapid rate of operculum movement accompanied by occasional gulping of air and ultimately loss of equilibrium on exposure to different concentration of the chemical.

The biological effects of lead upon aquatic as well as terrestrial organisms vary according to species, duration of exposure, concentration of lead and experimental factors such as hardness of water and pH. The organic form tends to produce more toxic effects at lower concentration than inorganic form. In contrast, effects of lead on fish behavior are less studied. The industrial effluents have altered the natural conditions of aquatic medium which causes behavioural changes and morphological imbalance of aquatic organisms. The behavioural changes in fish has been found to be a sensitive tool for assessment of metal toxicity. Heavy metals in limited quantity are very essential for biological processes but their excess not only affects the life sustaining processes but also causes imbalances in the bio-diversity.

The aim of the present study was to estimate acute toxicity values of lead acetate and its effects on behavioural changes of a freshwater catfish, *Heteropneustes fossilis* at different dose and time intervals. Control fish kept in tap water tended to move together, come to the water surface at regular intervals to gulp air, or rested at the bottom. Fish exposed to different concentrations of lead acetate exhibited abnormal behavioural changes. The fish struggled hard for breathing, engulfing atmospheric air and to avoid toxic medium. These changes were manifested by increased opercular movement, erratic swimming, restlessness and excess mucous secretion from the gills and body surface. Finally fish progressively became sluggish and lethargic.

The freshwater bodies are being polluted by various pollutants which have adverse effects on aquatic organisms. The freshwater organisms, particularly fishes are more susceptible to these pollutants. Since, their habitats are confined, escape from such polluted habitats is impossible.

Acute bioassay toxicity tests with fish have long played a major role in aquatic hazard and risk assessments, especially at a "screening level of evaluation". Several workers have estimated LD/LC50 values of individual pollutants like pesticides, dyes, detergents, metals and fertilizers at different time intervals for mammals and aquatic animals. However, the acute toxicity data of aquatic animals, especially fish are scanty. It may, however, be pointed out that the toxicity of individual toxicants to different species of fish are different to compare because they are influenced by various factors such as temperature, pH, hardness and dissolved oxygen of test water

This value can be considered safe to other Indian freshwater fish species also until additional data on the safe concentration of this chemical is available. In terms of environmental significance, concentration of lead acetate in water exceeding safe concentration must be considered hazardous to fish as it can accumulate as residues and is not easily biodegradable. The effects of pollutants are generally characterized on survival, reproduction or growth due to physiological alteration in the animal. The physical, chemical and biological components of the environment play an important role in manifestation of biological response to pollutants. The toxicity of particular pollutants depends upon many factors such as animal weight and development stages. The response of animal to toxic medium is important since it reflects the in internal changes.

The behaviour of the fish observed during this study is similar to that observed by various workers for teleostean species under influence of several water pollutants, viz., pesticides, dyes, detergents, metals and fertilizers The avoidance reactions by the fish have been one of the most commonly mentioned parameters in behavioral studies with pollutants. In the present study, fish exhibited frequent jumping, erratic movement, secretion of excess mucous from the gills and the body. The fish appeared excited with a rapid rate of operculum movement accompanied by occasional gulping of air and ultimately loss of equilibrium on exposure to different concentrations of the chemical. These observations are in agreement with the reports of earlier investigators who similar observations on exposure to pesticides, detergents and fertilizers on freshwater fish.

Conclusion: At present, pollution has become a global problem because of population growth, industrialization, urbanization and man's over exploitation of nature. Of all the pollution types, the aquatic pollution is of greater concern because almost all kind of life is dependent on water. The pollutants also destroy the quality of water bodies and render them unfit for aquatic organisms especially to the fishes.

So, it has become necessary to formulate strict rules against indiscriminate use of these chemicals. For safe use of chemicals more experimental work should be performed to determine the concentration and time of exposure that do not harm the fish and other higher animal community.

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Chapter - 8
Gamma Ray and EMS Induced Mutations in Aromatic Rices

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Chapter - 8

Gamma Ray and EMS Induced Mutations in Aromatic Rices

Sanjeev Singh, Rishi Kumar Sharma, Satish Kumar Chakravarti, S.B. Verma and Prakash Singh

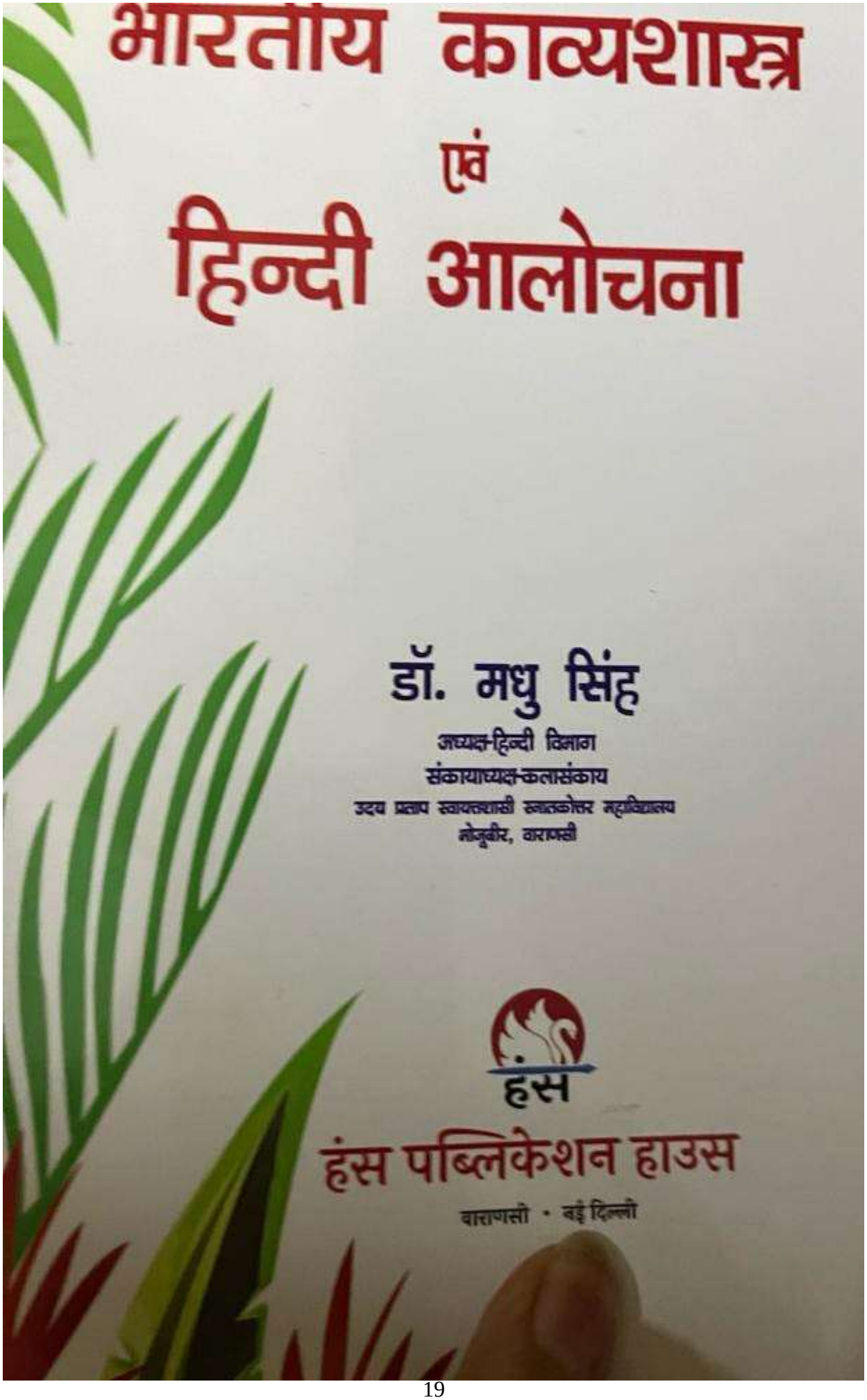
Abstract

The primary need of crop improvement is selection, which is based on variability. Without variation, selection is ineffective. Among various methods, mutation is regarded as an important tool for creating genetic variability. A study was made to evaluate yield and yield attributing traits in M_4 generation of two aromatic rice cultivars namely Pusa Basmati 1 and Kalanamak after treatment with gamma rays (10 kR, 20 kR, 30 kR, 40 kR and 50 kR doses) and EMS (0.2%, 0.3%, 0.4% and 0.5% concentrations) alone and/or in their combinations (10 kR + 0.2% EMS, 20 kR + 0.2% EMS, 30 kR + 0.2% EMS, 40 kR + 0.2% EMS and 50 kR + 0.2% EMS). Various types of macromutation were observed in M_2 generation. Of these, 9 mutants from Pusa Basmati 1 and 12 from Kalanamak were identified as true breeding for plant morphology and maturity characters in M_4 generation. Many micro mutants showed a significant improvement for yield and other yield components as compared to their parents. The traits like plant height, number of panicle bearing tillers per plant, days to flowering, number of grains per panicle and days to maturity showed higher values of heritability. High heritability combined with high genetic advance for number of grains per panicle and number of panicle bearing tillers per plant in the mutant lines of both the cultivars Pusa Basmati 1 and Kalanamak. Advocated that selection would be effective for these traits. The mutation breeding is reckoned to enlarge the frequency and spectrum of mutations to increase the incidence of viable mutations as an approach towards directed mutagenesis leading to develop short stature, early maturing and high yielding traits in aromatic rices.

Keywords: Aromatic rice, macromutation, gamma rays, EMS

Introduction

The primary objective of the mutation breeding is to enhance the frequency and spectrum of mutations and also to increase the incidence of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Chapter 3
Phytochemicals/plant extract against Alzheimer's

Section 3.1
Phytochemicals (pure compounds)

Chapter 3.1.2

Curcumin

Ashutosh Paliwal[1], **Ashwini Kumar Nigam**[2], **Jalaj Kumar Gour**[3], **Deepak Singh**[1], **Pooja Pandey**[1], **Manoj Kumar Singh**[4]

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Introduction

Plants are important sources of natural bioactive compounds with tremendous therapeutic potential. Extracts of different parts of plants have been used in traditional medicinal systems since ancient times. The unavoidable side effects of synthetic drugs during disease treatment and management are necessitating the exploration/need/search for safer substitutes. Herbal medication is now emerging as the most promising alternative and is expected to revolutionize the modern methods of disease treatment.

The Indian subcontinent is blessed with diverse but less explored medicinal flora. The traditional Indian health system is based on herbal formulations. There are many medicinal plants available in various parts of India that possess a broad array of phytomedicinal properties including having antimicrobial, antiinflammatory, antioxidant antineoplastic, antianalgesic, and antipyretic potentials. These bioactivities are due to the presence of various chemical compounds called phytochemicals, which are synthesized in plants naturally. The interest of public and scientific communities in the phytochemical domain in which curcumin is very prevalent is very considerable. Curcumin, an important phytochemical with a well-known medicinal spectrum of activities is an active ingredient of the rhizome of the turmeric plant. This plant is an annual herb (*Curcuma longa* Linn.), known as turmeric in English, Haldi in Hindi, and has been used in Asia for its medicinal properties since the second millennium BC. In Indian household daily practices, turmeric is generally considered and recommended as an antiseptic agent. It is used along with many other natural combinations. Curcumin (diferuloylmethane) is a low-molecular-weight polyphenol (Fig. 3.1.2.1) that has antioxidant, antiinflammatory,

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Chapter 3
Phytochemicals/plant extract against Alzheimer's

Section 3.1
Phytochemicals (pure compounds)

Chapter 3.1.3

Omega 3 PUFA

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Introduction

Fat, or more appropriately lipid, is an essential macronutrient which not only provides nutrition but also is essential for the delivery of energy and cell growth. Lipids are mainly comprised of carbon and hydrogen atoms which puts them in the hydrophobic category. Chemically, lipids are the esters of fatty acids with an alcohol. Alcoholic moiety in lipids may be glycerol as in triglycerides and phospholipids, sphingosine as in many glycolipids, or triacontanol as in waxes. Fatty acids are long-chain carboxylic acids containing more than four carbon atoms in their long hydrocarbon tail. Structurally, fatty acids are categorized into two classes—saturated and unsaturated fatty acids. Saturated fatty acids do not contain a double bond in the chain, e.g., myristic acid (C14:0), palmitic acid (C16:0), stearic acid (C18:0), etc. Lipids or triglycerides containing only saturated fatty acids are solid at room temperature, and are known as fats with high melting points. Unsaturated fatty acids contain one or more double bonds in their long hydrocarbon chain. Lipids or triglycerides having abundant unsaturated fatty acids are called oils, and remain in a liquid state at room temperature, i.e., they have a low melting point. Further, unsaturated fatty acids are of two types—monounsaturated fatty acids (MUFAs) with only one double bond and polyunsaturated fatty acids (PUFAs) having two or more double bonds. MUFAs include palmitolic acid (C16:1, *cis*-Δ^9) and oleic acid (C18:1, *cis*-Δ^9). There is a long list of PUFAs, which have more than one double bond.

On the basis of nutritional requirements, fatty acids are classified as nonessential and essential fatty acids. Most organisms are capable of

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3.1.13. Spinosin

3.1.14. Nobiletin

Section 3.2 Plants and their extracts

3.2.1. *Ginkgo biloba*

Chapter 3.2.1

Ginkgo biloba

Ashutosh Paliwal[1], Pooja Pandey[1], Kushagra Pant[2], Manoj Kumar Singh[3], Vipul Chaudhary[4], Jalaj Kumar Gour[5], Ashwini Kumar Nigam[6], Vimlendu Bhushan Sinha[7]

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Introduction

This decade can be described as the decade of technology. It is true that technology is an elementary tool in this rapidly changing world. However, as we know, every story has two sides. The good part of this technology is that it reduces work pressure with time saving, but on the other hand technology may induce various neurological disorders. In this world the older population is more affected by neural disorders, such as dementia, which are attributed to progressive neurodegenerative disorders that have now become a social problem worldwide. The global population's health is a social issue (Hugo and Ganguli, 2014; Zhang et al., 2008). Cognitive decline can be both moderate impairment (MCI) and dementia (Howieson, 2016; Jørgensen et al., 2016; Mormino and Papp, 2016). A small but evident diminution in cognitive function is seen during mild/moderate cognitive impairment (MCI), referred to as the evidence stage before dementia (Budson and Solomon, 2012; Fernández-Blázquez et al., 2016; Petersen, 2016). MCI is categorized into: MCI due to Alzheimer's disease (AD) and MCI due to other causes, wherein dementia is described as psychic retardation syndrome (Damiani et al., 2014; Ihl et al., 2015; Wang et al., 2016). The causes include Alzheimer disease, mixed dementia, and vascular dementia (Montine et al., 2014; Altamura et al., 2016). Alzheimer is a type of neurodegenerative disorder which starts with moderate memory problems and within a year develops into multiple cognitive and functional impairment (Brooker et al., 2014; Aygün and Güngör, 2015; Wood,

Naturally Occurring Chemicals against Alzheimer's Disease. https://doi.org/10.1016/B978-0-12-819212-2.00017-7

Microbial Technology for Sustainable Environment

Pankaj Bhatt • Saurabh Gangola •
Dhanushka Udayanga • Govind Kumar
Editors

Microbial Technology for Sustainable Environment

Springer

Chapter 12
Microbial Engineering and Applications for the Development of Value-Added Products

Ashutosh Paliwal, Abhishek Verma, Ashwini Kumar Nigam, Jalaj Kumar Gour, Manoj Kumar Singh, and Rohit Kumar

Abstract Downstream is a very affluent process for fermentation. It usually involves complicated equipment and processes to obtain desired chemicals or materials from intra- and/or extracellular spaces of microorganisms. Recently, it becomes possible to simplify the microbial cell separation processes by morphologically engineering the shapes of small microorganisms. Biologically engineered entities have enabled discoveries in the past decade and a half, spanning from novel routes for the syntheses of drugs and value-added products to carbon capture. The precise cellular reprogramming has extended to the production of nanomaterials owing to their ever-growing demand. Additionally, nutraceuticals are important natural bioactive compounds that confer health-promoting and medical benefits to humans. Globally, growing demands for value-added nutraceuticals for prevention and treatment of human diseases have rendered nutraceuticals a multi-billion dollar market. However, supply limitations and extraction difficulties from natural sources such as plants, animals, or fungi restrict the large-scale use of nutraceuticals. Metabolic engineering via microbial production platforms has been advanced as an eco-friendly alternative approach for production of value-added nutraceuticals from simple carbon sources. Microbial platforms like the most widely used

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Compatible Solutes Engineering for Crop Plants Facing Climate Change

Shabir Hussain Wani
Manu Pratap Gangola • Bharathi Raja Ramadoss
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Compatible Solutes Engineering for Crop Plants Facing Climate Change

Springer

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Chapter 10
Effect and Importance of Compatible Solutes in Plant Growth Promotion Under Different Stress Conditions

Ashutosh Paliwal, Abhishek Verma, Harshita Tiwari, Manoj Kumar Singh, Jalaj Kumar Gour, Ashwini Kumar Nigam, Rohit Kumar, and Vimlendu Bhushan Sinha

Abstract A plant requires favorable conditions for their growth. When minerals, temperature, light, pH, and water are present in their optimum concentration, plant grows well, but any change in their level affects the growth of the plant. A situation that does not promote plant growth is called stress. For optimum growth of plants in stress conditions, the plant accumulates compatible solutes, an organic compound that is nontoxic and nonreactive and manages osmotic pressure in plants. Plants synthesize different types of compatible solutes in different kinds of biotic as well as abiotic stress. Compatible solutes also scavenge reactive oxygen species (ROS), and in this way, it could protect plants from oxidative stress. In this chapter, we review different types of compatible solutes and their impact on stress conditions. We also summarize the role of compatible solutes in plant growth promotion.

Keywords Stress · Glycine betaine · Plant growth · Compatible solutes

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Chapter 11
Compatible Solute Engineering: An Approach for Plant Growth Under Climate Change

Ashutosh Paliwal, Harshita Tiwari, Manoj Kumar Singh, Ashwini Kumar Nigam, Jalaj Kumar Gour, Rohit Kumar, and Deepak Kumar

Abstract Agriculture is not only a livelihood source but also fulfils the nutritional requirement of humans. To feed the world population increasing at an alarming rate, crop production must be increased. However, crop production is adversely affected by various abiotic factors or changes in climatic conditions worldwide. Climate exhibits a direct impact on the yield of the crop. In stress condition, the physiological state of plants gets altered that ultimately affects the overall growth of plants. Plants exhibit different mechanisms to survive these stress conditions. Plants synthesize and accumulated non-toxic, non-reactive organic compounds to counter the unfavourable conditions, and these compounds are known as compatible solutes. Compatible solutes exhibit beneficial characteristics by which plants could survive in hostile environments. Hereby, we discussed the role of few important compatible compounds and their role in plant growth as well as in different stress conditions. We have also summarized the effect of inducible changes in the compatible solutes on plant growth under different climatic conditions.

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★Anil Kumar Singh
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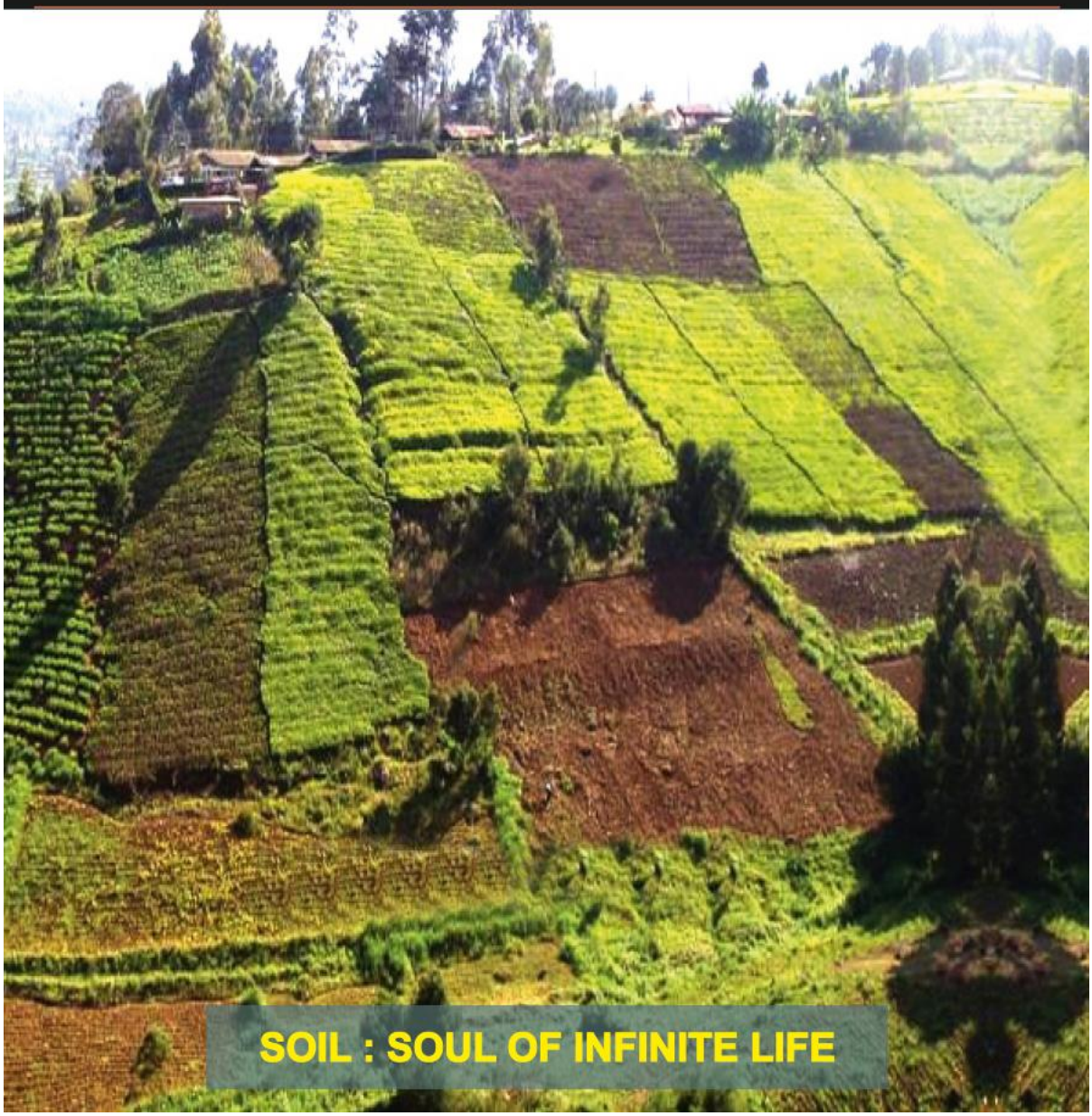

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A COMPREHENSIVE NOTE ON SOIL SCIENCE

18 REMOTE SENSING

Aditya Kumar, Sanjay Kumar Shahi

Introduction

Remote sensing provides the cutting-edge technologies to obtain information on the geographical location for various aspects, without making any physical touch with the targets at that location. This information was later used to represent the area in the form of a map by using various Geo-spatial technologies. We will learn about the principles of remote sensing, electromagnetic spectrum, various platforms used for remote sensing, image interpretation methods, processing and classification of data obtained through remote sensing and application of remote sensing in various fields, in this chapter.

Remote Sensing

Definition

According to **Sabins (1996)** "*Remote sensing is the science of acquiring, processing and interpreting images that record the interaction between electromagnetic energy and matter*". **Lillesand and Kiefer (1979)** defined it as "*the science and art of obtaining useful information about an object, area or phenomenon through the analysis of data acquired by a device that is not in contact with the object, area, or phenomenon under investigation*".

Principle

Electromagnetic radiations either transmitted or absorbed or emitted or scattered by objects on the earth's surface, act as a carrier for the transfer of information during remote sensing. Steps involved in remote sensing are as follows:-

A. Energy source.

B. Interaction of ectromagnetic radiations with the atmosphere.

C. Interaction of electromagnetic radiations with the feature of the earth.

D. Transmission of electromagnetic radiations to the sensor.

E. Transmission and reception of the signal from the sensor to signal receiving station on earth.

F. Data acquisition, processing and utilization.

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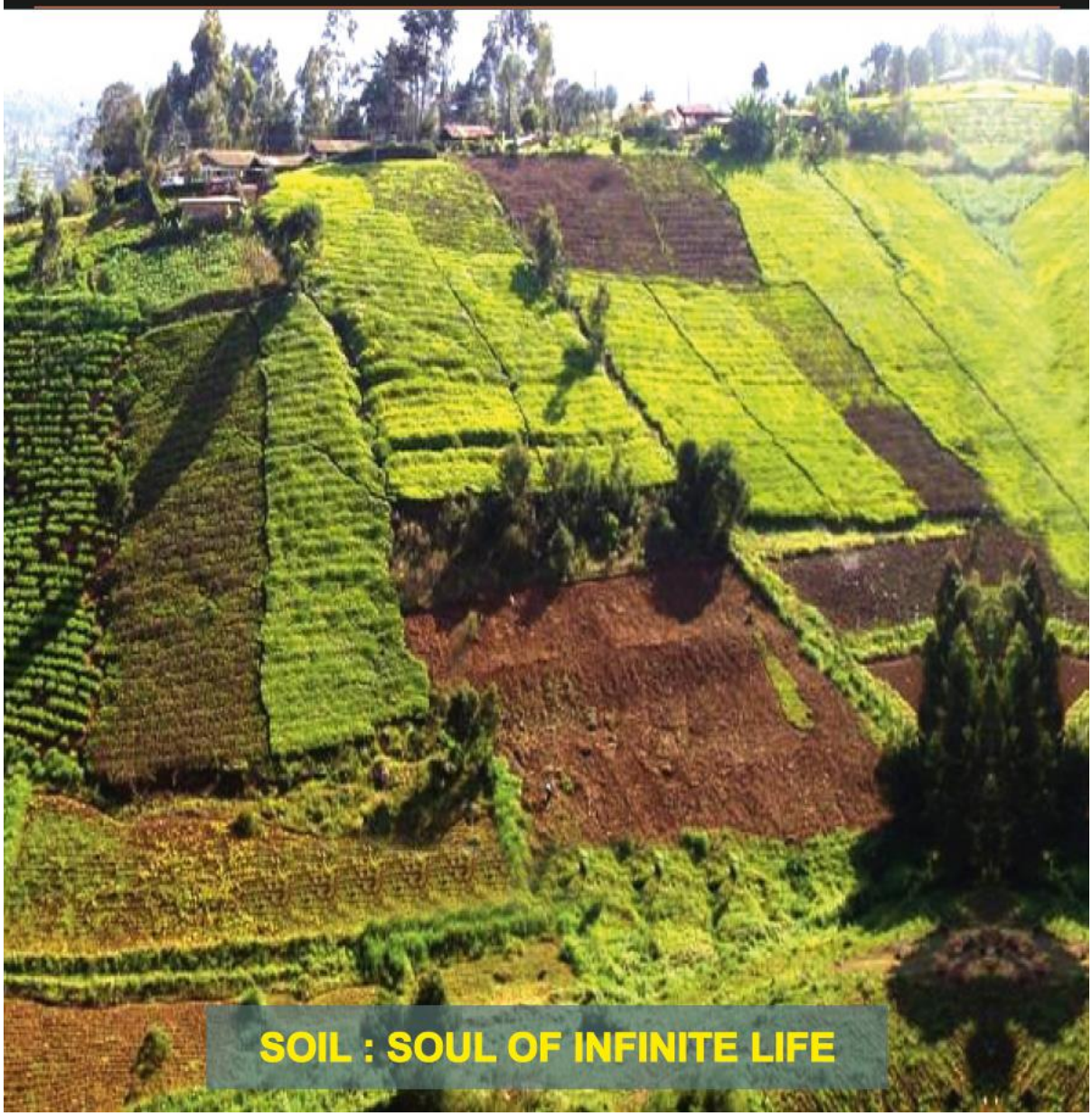

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A COMPREHENSIVE NOTE ON SOIL SCIENCE

19 RADIO ISOTOPES

Aditya Kumar, Dr Sanjay Kumar Shahi, Vineeta Singh

Introduction

Radio isotopes are utilized in the field of agricultural research for enhancing agricultural sustainability and productivity. Areas in which isotopes are employed are soil fertility management, soil physical and chemical studies. Under this chapter, the emphasis is being given to discuss the fundamentals of radioactivity, radioisotopes application in the field of agriculture and particularly in the field of soil science. To better understand radioactivity and radioisotopes, it is essential to know about the fundamentals of atomic structure.

Atomic structure

Atom is the smallest unit of all the matters, which means "indivisible" in the Greek language. The main constituents of atoms are electrons, protons and neutrons. The mass of an atom is constituted due to protons and neutrons. An electron has a very small mass i.e. 9.108×10^{-28} grams. Nucleon term is used collectively for both protons and neutrons because they occupy in the nucleus. Electrons, protons and neutrons have negative (-), positive (+) and no charge, respectively. Electrons revolve around the orbits around the nucleus. The size of the nucleus is much smaller than the atomic size. The nucleus was discovered in 1911 by Ernest Rutherford and associates from their alpha scattering experiments on thin gold foil. From their experiments, nuclear charge and size (10^{-13} cm) were first determined. The number of protons in the nucleus is termed as atomic number; whereas the number of protons and neutrons in the nucleus is defined as the mass number.

Some facts about atomic structure

- For an element X, atomic number and mass number can be symbolized as $^{A}\mathbf{Xz}$

  Where Z- atomic number and A- mass number
- **Mass number (A)=Atomic number (Z) +Number of neutrons (N)**
- The mass of the atomic particles is described in terms of the **atomic mass unit** (or **amu**).
- **1 atomic mass unit = 1.66054×10^{-24} grams**.
- Mass of Proton, Neutron and Electron is 1.0073, 1.0087 and 5.486×10^{-4} amu, respectively.

Binding energy

The energy released in the hypothetical process of bringing Z protons and N neutrons together to form a nucleus is called binding energy. In other words, it is the energy that must be put into a nucleus to break it apart and remove proton or a neutron from the nucleus. Nuclear binding energies are around 8 Mev (million electron volt) per nucleon. The binding energies are

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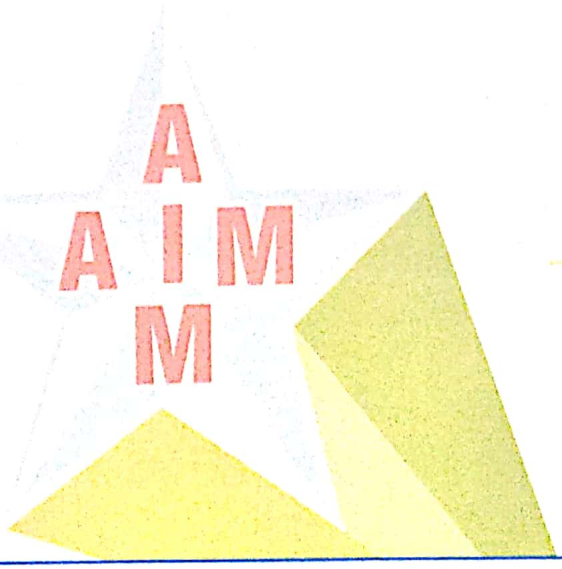

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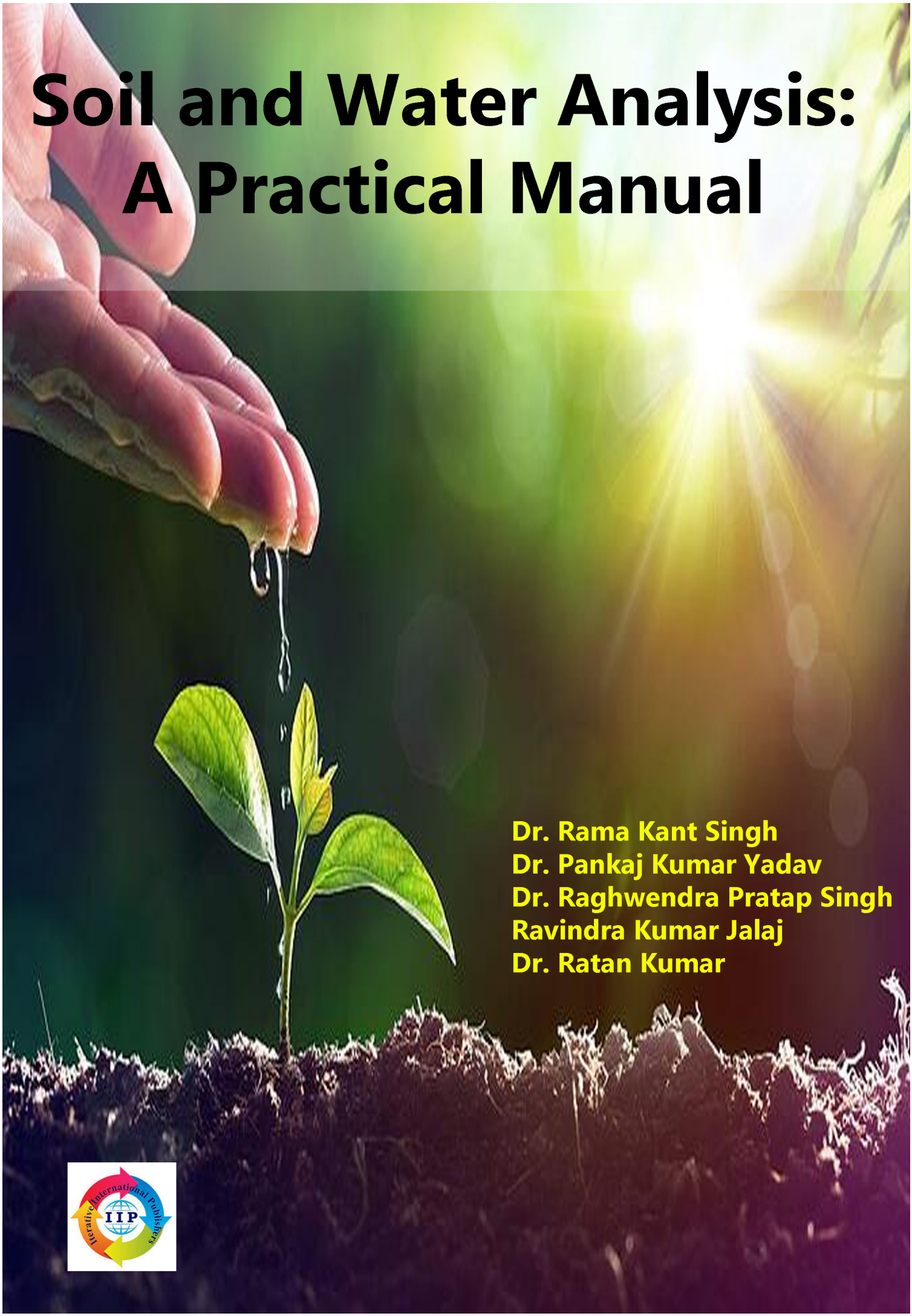

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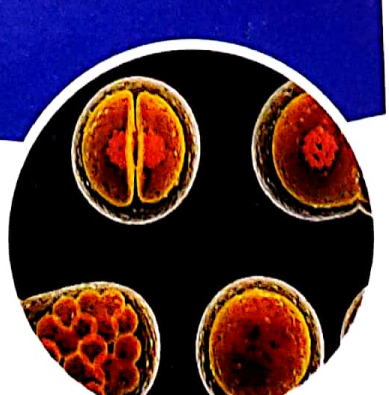

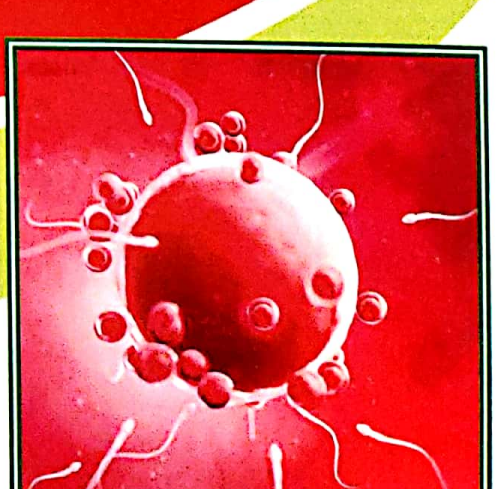

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SYLLABUS

Unit-I
Herbarium: Plant Collection, Preservation and Documentation

Stepwise Practicing Herbarium Techniques: (a) FIELD EQUIPMENTS, Global Positioning System (GPS) instrument & Collection of any wild 25 plant specimens, (b) Learn to handle Herbarium making tools, (c) Pressing and Drying of collected plant specimens, (d) Special treatments for various groups of plants, (e) Mount on standard herbarium sheets, (f) Label them using Standard method (g) Organize them and give Index Register Number Taxonomic Identification using plant structure

Unit II
Taxonomic Identification using Plant Structure

(a) Classify 25 plants on the basis of Taxonomic description (Plant Morphology, Anatomy, Reproductive parts, Habit, adaptation anomalies) according to Bentham and Hooker system of classification in the following families: Malvaceae, Fabaceae (Papilionaceae), Solanaceae, Acanthaceae, Labiatae (Lamiaceae), Rubiaceae, Poaceae.

Unit III
Identification during excursions

(a) Conducting Spot identification (Binomial, Family) of common wild plants from families included in the theoretical syllabus (list to be provided) and making FIELD NOTE BOOK and filling Sample of a page of field-book, used in Botanical Survey of India.

(b) Describe/compare flowers in semi-technical language giving V. S. of flowers, T. S. of ovaries, Floral diagrams and Floral Formulae. Identify and assign them to their respective families giving reasons.

Unit IV
Collection, Preservation and Storage of Algae, Fungi Bryophytes, Pteridophytes (Two each)

Unit V
Botanical Nomenclature & reporting Method

(a) Give nomenclature to collected plants as per ICN rules and prepare labels as per BSI.

(b) Author Citation, Effective Publication and Principle of Priority: To show specimen paper on Basic structure of a taxonomic Research published on a new species in taxonomic Journal.

Unit VI
Computer Application and Character Coding

(1) Learning to use EXCEL Microsoft PowerPoint and Word, working with folder and windows utility, create and manage files and folder tree, Selection of Character, Coding and Preparation of Data Matrix in MS Office or MS Excel.

(2) Practice browsing different sites using search engines, practice and understand different E-Mail services - Outlook, Yahoo mail, rediffmail etc. Practice Creating E-Mail accounts, Sending, Receiving & Storing of mails.

(3) Create and Participate in virtual conferencing in an interactive Zoom Meeting.

Unit VII
Computer Application in taxonomy

(1) Use Taxonomic Software's (Dichotomous Key)
(2) Practical's on Phylogenetic analysis
(3) Make line drawing of Plants for description
(4) Using of plant identification apps on android phones

Unit VIII

(1) Create a Bonsai of any plant
(2) Develop a miniature garden
(3) Draw Layouts of various types of gardens
(4) Plant Propagation methods practice

About the Book :

This book has been design according to latest syllabus of prescribed by UGC and Department of Higher education, Government of India for implementation national education policy 2020. The present book is very beneficial for B.Sc. students of all Indian universities and colleges. The book covers the whole syllabus of B.Sc. Vth semester of paper 1st. Along with whole syllabus general introduction about Organic Chemistry also given in order to make easy to understand organic chemistry. Some important points of present book are: * The book is written in very systematic manner and easy language. Hence, it is easily understand by self-study. *Large numbers of objective and subjective questions have been providing at the end of the each unit. *Several diagrams and examples have been given in each chapter to aid student's understanding subject of matter. The authors have been taken every precaution to maintain accuracy and clarity of the book matter.

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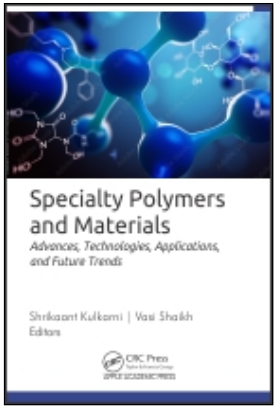

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Recent advances in polymers for Oilfield applications: Focus on Carbon Geo-storage

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Abstract

Rising anthropogenic levels of CO_2 in the atmosphere have led to runaway climate change, which threatens the continued existence of humankind. One of the most pertinent technologies to fight climate change is CO_2 geo-storage, but the injected CO_2 tends to disperse in the formation, reducing the overall sweep efficiency and gas storage volume. To mitigate this, polymers may be used in the subsurface for conformance control of CO_2 by forming a barrier that restricts, redirects, and ensures proper distribution of the flow of CO_2 in the reservoir. This chapter discusses the use of polymers in various forms for CO_2 geostorage in the oilfield. One way is that the polymer can be injected into the reservoir as a solution, which then undergoes gelation or crosslinking in situ to form a permeability-reducing barrier. The barrier can help channel the injected CO_2 to the desired location, increasing the efficiency of CO_2 flooding for enhanced oil recovery. One approach for conformance control is using polymer gels. These gels are created by crosslinking polymer molecules using a chemical or physical process and can be tailored to have specific properties such as viscosity, strength, and permeability. Another approach for conformance control is with smart polymers. These polymers are designed to undergo a reversible phase transition in response to changes in temperature, pH, or other environmental stimuli. For CO_2 flooding applications, smart polymers can be designed to selectively swell or shrink in response to CO_2, creating a permeability-reducing barrier that restricts the flow of CO_2. Furthermore, the chapter also covers the synthesis and characterization of hybrid multi-polymer, polymer-surfactant, and polymer-nanocomposite systems for use in varying applications.

Keywords: Carbon capture & storage, Conformance control, Enhanced Oil recovery, Polymer flooding, Sandstones, Oil recovery.

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Recent Advances in Horticulture

- Dr. Shiv Shankar Verma
- Dr. Shivaraj Kumar Verma
- Dr. Brij Mohan Singh
- Ms. Sneh Lata

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About the Book

This book entitled "Recent Advances in Horticulture" is a compilation work and every possible effort has been made to cover the most important aspect of Horticulture. In this book, comprising chapters based on emerging studies and research to achieve sustainability through Horticulture. This book has basically been prepared for the graduate and post graduate students of Agricultural University of India and abroad. Teachers, Researchers, professionals, farmers will also get benefits from this book.

Dr. Shiv Shankar Verma is presently working as Subject Matter Specialist (Horticulture) in Krishi Vigyan Kendra Moradabad (SVPUA&T), Meerut (UP). He completed his B.Sc.(Ag), M.Sc.(Ag) in Horticulture and PhD in Horticulture from ANDUA&T kumarganj, Ayodhya(UP) respectively. Dr Verma qualified ICAR,NET(2010) he has specialisation in fruit science. Dr Verma has 29 publications (Research paper: 15,Book chapter: 5 and popular/ semi scientific articles: 9). He has participated in several National and International seminar's and received Young scientist award, Scientist associate award and Best thesis award.

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