

Forestry Practicals

Forestry Practicals

Dr. K. K. Chandra

&

Mr. Rajesh Kumar



Published by
SCIENTIFIC PUBLISHERS (INDIA)
5 A, New Pali Road, P.O. Box 91
Jodhpur 342 001 (INDIA)
E-mail: info@scientificpub.com
Website: <http://www.scientificpub.com>

© 2022 Publisher

All rights reserved. No part of this publication or the information contained herein may be reproduced, adapted, abridged, translated, stored in a retrieval system, computer system, photographic or other systems or transmitted in any form or by any means, electronic, mechanical, by photocopying, recording or otherwise, without written prior permission from the publisher.

Disclaimer: Whereas every effort has been made to avoid errors and omissions, this publication is being sold on the understanding that neither the editors (or authors) nor the publishers nor the printers would be liable in any manner to any person either for an error or for an omission in this publication, or for any action to be taken on the basis of this work. Any inadvertent discrepancy noted may be brought to the attention of the publisher, for rectifying it in future editions, if published.

This book contains information obtained from authentic and highly regarded sources. Reasonable efforts have been made to publish reliable data and information, but the editors and publisher cannot assume responsibility for the validity of all materials or the consequences of their use. The editors and publisher have attempted to trace and acknowledge the copyright holders of all material reproduced in this publication and apologize to copyright holders if permission and acknowledgment to publish in this form have not been obtained. If any copyright material has not been acknowledged please write and let us know so that we may rectify it.

Trademark Notice: Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.

ISBN: 978-93-91418-36-6
e-ISBN: 978-93-91418-52-6

Printed in India

AUTHORS

Dr. K. K. Chandra

Dr. K. K. Chandra is a gold medalist in M.Sc. Forestry, Wildlife, and Environmental Sciences for scoring the first position in the University merit. He has awarded a Ph.D. from Forest Research Institute (A deemed University), Dehradun, Uttarakhand Ministry of Environment, Forest and Climate Change, Government of India in 1998. He has served the State Forest Research Institute,



Jabalpur, for four years in the capacity of Junior Scientist, Narendra Deva University of Agriculture and Technology, Ayodhya, (U.P.) for 11 years as Subject Matter Specialist (Agroforestry). He is presently working as Associate Professor in Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur Chhattisgarh in Forestry, Wildlife, and Environmental Sciences department since 2012. He has been awarded Junior Research Fellow, Senior Research Fellow, and Research Associate from the Indian Council of Forestry Research and Education (ICFRE, an autonomous institute of the MOEFCC, GOI), Dehradun, (Uttarakhand). He has qualified National Eligibility Test twice from the Agricultural Scientists Recruitment Board (ASRB), New Delhi. He has awarded with “Young Scientist Associate Award” in the 18th Indian Agricultural Scientists & Farmer’s Congress 2016 at Bioved Krishi Prodyogiki Gram, Allahabad (U. P.), and “Distinguished Faculty Award 2016” in Venus International Faculty Meet, Chennai for his outstanding contribution on Tree Microbe interaction.

Three Research projects on the Evaluation of Assisted natural regeneration of Sal, Teak, and Mixed natural forest (World Bank FREE project), biofertilizers Mass production of biofertilizers, and High Tech plantations have been completed successfully. The establishment of the model nursery project was also sanctioned to him by the UP Council of Agricultural Research (UPCAR), Lucknow. He has recently completed two externally funded research projects as Principal Investigator on Vesicular Arbuscular Mycorrhizal fungi in entisol soil and the carbon stock potential in agroforestry species of eastern Chhattisgarh. These projects were sanctioned by the University Grant Commission, New Delhi and Chhattisgarh Council of Science and Technology, Raipur, (CG). Moreover, he has submitted three major research projects to the Department of Science and Technology, New Delhi, Science and Engineering Research Board (SERB), New Delhi, and Department of Biotechnology, New Delhi.

He is supervising Ph.D. Scholars and currently four Scholars are pursuing their degree under him.

Dr. Chandra has published more than 60 research papers in national and international journals having impact factors. He has vast experience and expertise in tree microbe-interaction, agroforestry, and medicinal plants. Twenty popular articles, three books on agroforestry, medicinal plants are in his credit. He contributed to the edited book of international publishers. He has delivered invited talks in forestry institutes, State Forest Department, Agricultural Universities, Human Resource Development Center of the University, and national and international conferences. He has delivered more than 15 radio talks and 40 television talks as a subject expert on various topics. Presently, he teaches B.Sc., M. Sc., and Ph. D. courses and contributes to various university committees. He is also working as Nodal Officer, Unnat Bharat Abhiyan cell of the University, and has organized several activities in adopted villages to improve rural society's standard.

Mr. Rajesh Kumar

Mr. Rajesh Kumar is a meritorious and young Scholar pursuing a Ph.D. from the Department of Forestry, Wildlife & Environmental Science, Guru Ghasidas Vishwavidyalaya (Central University), Bilaspur Chhattisgarh. He has completed M.Sc. in agroforestry from Sam Higginbottom University of Agriculture and Technology and Sciences (SHIATS), Prayagraj (U.P), in 2016. Mr. Kumar has qualified National Eligibility Test of Agricultural Scientist Recruitment Board (ASRB), New Delhi. He has published 12 research papers in reputed journals on forestry and agricultural forestry and presented papers in national and international conferences. He has been the recipient of the "Best Thesis Award 2019" in the International Seminar on Climate Resilience of Agricultural Biodiversity, Technology & Marketing Policy, Allahabad, Prayagraj (U.P), and "Young Teacher Award 2018" in the International Conference on Food Security and Sustainable Agriculture, Pattaya, Bangkok, Thailand.



CONTENTS

1. Forest Mensuration, Mathematical Forestry, Biometry	1 – 36
1.1 Diameter and Girth Measurements	
1.2 Tree Height Measurement	
A. Ocular method	
B. Shadow method	
C. Single pole method	
D. Abney's level Method	
1.3 Determination of Bark Thickness	
1.4 Measurement of Tree Form Factor	
1.5 Estimation of Tree Volume	
• Felled tree	
• Standing tree	
1.6 Estimation of Tree Age	
• Pressler borer	
• By periodic measurement method	
1.7 Determination of Past Growth of Trees	
• Stump analysis	
• Stem analysis	
1.8 Estimation of Tree Biomass	
• Destructive method	
• Non- destructive method	
1.9 Calculation of Tree Canopy Area	
1.10 Forest Rotation	
1.11 Measurement Leaf Area Index	
2. Agroforestry, Carbon Forestry	37 – 64
2.1 Characterization and Identification of MPTs	
2.3 Evaluation of Crop Growth Parameters in Agroforestry System	
2.4 Assessment of the Allelopathic Effect of Trees	
2.5 Delineation of Agro-climatic Zones of India	
2.6 Estimation of Carbon Stock and Sequestration of Forests	
• Nebraska method	
• Volume equation method	
2.7 Litter Production and Decomposition	

- 2.8 Tree Root Spread Evaluation
 - Coarse root
 - Fine root
- 2.9 Measurement of Soil Erosion
 - Root exposure method
 - Tree mound method
- 2.10 Measurement of Stem Flow and Through Fall
- 2.11 Infiltration Rate of Soil
- 2.12 Establishment of Nutritional Garden
- 2.13 Training and Pruning of the Tree
- 2.14 Wasteland Development

3. Forest protection, Forest Pathology, Forest Entomology 65 – 96

- 3.1 Serial Dilution Method
- 3.2 CFU Calculation of Fungal Culture
- 3.3 Preparation of Potato Dextrose Agar (PDA) Media
- 3.4 Microbial Biomass Carbon
- 3.5 Examination of Mycorrhizal Fungi in Roots
- 3.6 Mycorrhizal Spore Extraction
- 3.7 Efficacy Testing of Fungicides
- 3.8 Efficacy and Toxicity of the Insecticides
- 3.9 Prospects of Bio-pesticides in Forestry
- 3.10 Integrated Weed Management (IWM)
- 3.11 Integrated Pest Management (IPM)
- 3.12 Integrated Disease Management (IDM)
- 3.13 Insecticides and Its Formulations

4. Nursery technology, Silviculture 97 – 200

- 4.1 Forest Nursery
- 4.2 Nursery and Plantation Tools
- 4.3 Plant Containers in Nursery
- 4.4 Plant Nutrients
- 4.5 Integrated Plant Nutrient Management (IPNM)
- 4.6 Diagnosis of Nutrient Deficiencies in Plants
- 4.7 Nitrogen Fixation
- 4.8 Plant Response to Deficiency and Toxicity of Nutrients
- 4.9 Green Manuring
- 4.10 Nadep Compost
- 4.11 Vermicompost

- 4.12 Preparation of Fertilizer Mixture
- 4.13 Fertilizer Dose Calculation
- 4.14 Biofertilizers in Forestry
- 4.15 Pit Digging for Plantation
- 4.16 Vegetative Propagation of Plants
 - (a) Stem cutting
 - (b) Air layering
 - (c) Grafting
 - (d) Budding
- 4.17 Tillage and Tillage Equipment's
- 4.18 Clear Felling System
- 4.19 Identification of Trees by Seed
- 4.20 Identification of Trees by Leave
- 4.21 Identification of Trees by Bark
- 4.22 Observing Tree Pheno-phase
- 4.23 Layout of Plantation
 - (a) Square method
 - (b) Triangular method
 - (c) Quincunx method
 - (d) Rectangular method
 - (e) Hexagonal method
 - (f) Contour method
- 4.24 Indigenous Tree Species
- 4.25 Fast-growing Tree Species
- 4.26 Exotic Tree Species
- 4.27 Silvicultural Terminology

5. Environmental Sciences

201 – 216

- 5.1 Analysis of Calcium in the Water
- 5.2 Analysis of Hardness in the Water
- 5.3 Ascorbic Acid in Plant
- 5.4 Biological Oxygen Demand (BOD) in Water
- 5.5 Dissolved Oxygen in Water
- 5.6 Analysis of Nitrate in Water
- 5.7 Relative Water Content (RWC) and Water Saturation Deficit (WSD) in Plants
- 5.8 Determination of Water Salinity
- 5.9 Analysis of Silicate Content in Water

5.10 Studies of the Micro-environment of Forest and Plantations

- (a) Measuring Soil and Air and Temperature
- (b) Soil moisture
- (c) Light intensity

6. Forest Physiology**217 – 240**

- 6.1 Analysis of Protein in Plant Leaf
- 6.2 Assessment of Drought Tolerance in Plants
- 6.3 Buffer Solution
- 6.4 Cell Structure
- 6.5 Demonstration of Osmosis
- 6.6 Determination of Proline Content in Plant
- 6.7 Estimation of Chlorophyll and Carotenoid in Leaf
- 6.8 Demonstration of Mitosis Division in Root Tip
- 6.9 Demonstration of Plasmolysis
- 6.10 Molarity, Normality, and Other Solutions
- 6.11 Counting of Stomatal Density in Leaf
- 6.12 Transpiration
- 6.13 Water Potential Analysis

7. Wood Science and Technology**241 – 262**

- 7.1 Examination of Microscopic Features of Wood
- 7.2 Estimation of Specific Gravity of Wood
 - (a) Specific gravity method
 - (b) Wood density method
- 7.3 Determination of Wood Moisture
 - (a) Moisture meter technique
 - (b) Drying technique
- 7.4 Testing of Wood Strength
- 7.5 Measurement of Elasticity and Plasticity in Wood (MOE and MOR)
- 7.6 Measurement of Wood Toughness and Deflection
- 7.7 Determination of Moisture Absorption Rate in Wood
- 7.8 Determination of Swelling and Shrinkage Ability of Wood
- 7.9 Effectiveness of Wood Preservatives
- 7.10 Determination of the Combustion Rate of Wood
- 7.11 Identification of Susceptible Woods to Mold and Fungi
- 7.12 Plywood
- 7.11 Understanding the Grades of Plywood

8. Forest Ecology, Wildlife Management	263 – 282
8.1 Analysis of Forest Vegetation	
• Density	
• Frequency	
• Abundance	
• IVI	
• Shannon index	
• Simpson index	
• Community similarities	
• Alpha, Beta, and Gamma Diversity	
8.2 Biosphere Reserve	
8.3 National Park	
8.4 Sanctuary	
8.5 Wildlife Census	
8.6 Bird Watching	
8.7 Wildlife Telemetry	
8.8 Pugmark	
9. Forest Policy and Legislation	283 – 302
9.1 Forest Policy	
• Indian forest policy, 1894	
• National forest policy, 1952	
• National forest policy, 1988	
• National Agroforestry Policy, 2014	
• Draft national forest policy, 2018	
9.2 Forest Act (Law and Regulation)	
• Indian forest act, 1927	
• Forest (conservation) act, 1980	
• Wildlife protection act, 1972	
• The Biological Diversity Act, 2002	
• Forest conservation act, 1980	
• The scheduled tribes and other traditional forest Dwellers (Forest Right) act, 2006	
10. Forest Genetics and Tree improvement	303 – 314
10.1 Plant Growth Hormone	
10.2 Hybridization Techniques	
10.3 Micropropagation Technique	
10.4 Selection of Plus Tree	
10.5 Total Soluble Salt (TSS) in Fruit	
10.6 Tree Breeding and Improvement methods	

11. Forest Soil**315 – 344**

- 11.1 Soil Sampling
- 11.2 Soil Profile
- 11.3 Soil Texture
- 11.4 Soil Moisture by Gravimetric Method
- 11.5 Soil Colour by Munsell Soil Colour Chart
- 11.6 Determine Soil Bulk Density
- 11.7 Particle Density by Pycnometer Method
- 11.8 WaterHolding Capacity
- 11.9 Soil Temperature
- 11.10 Soil pH
- 11.11 Soil Electrical Conductivity
- 11.12 Analysis of Soil Organic Carbon (SOC)
- 11.13 Determination of Nitrogen in Soil and Plant
 - (a) Available nitrogen
 - (b) Total nitrogen
- 11.14 Determination of Phosphorus Content in Soil and Plant
 - (a) Available phosphorus
 - (b) Total phosphorus
- 11.15 Determination of Potash in Soil and Plant
- 11.16 Measurement of Soil Respiration

12. Forest Surveying and Engineering**345 – 380**

- 12.1 Determination of Pace Value and Distance Between the Given Points
- 12.2 Chaining Instruments and Accessories
- 12.3 Ranging and Chaining a Line
- 12.4 Determine the Area of Boundary
- 12.5 Compass Surveying and Observation of Bearing
- 12.6 Plane Table Surveying
- 12.7 Radiation Method of Plane Table Survey
- 12.8 Shape and Size Test for Clay Brick
- 12.9 Water Absorption Test for Brick
- 12.10 Compressive Strength Test of Brick
- 12.11 Fineness of Cement
- 12.12 Specific Gravity of Cement
- 12.13 Grain Size Distribution of Aggregate
- 12.14 Understand Road Features and Calculation of Camber and Gradient
- 12.15 Types of Bridges and Their Features

13. Forest Seed technology	381 – 400
13.1 Seed Dormancy and Its Breaking Methods	
13.2 Study of Seed Germination and Viability of Forest Species	
13.3 Seed Storage Methods and Experiment	
13.4 Synthetic Seed	
13.5 Seed Dispersal	
13.6 Seed Moisture by Oven Drying Method	
13.7 Seed Physical Purity	
13.8 Seed Certification	
13.9 Seed Hardening	
13.10 Biochemical Test of Seed	
14. Non-Wood Forest Products	401 – 412
14.1 Non Wood Forest Produces (NTFP)	
14.2 Resin Extraction	
14.3 Extraction of Gum	
14.4 Extraction of Essential Oil	
15. Forest Meteorology	413 – 422
15.1 Measurement of Atmospheric Temperature	
15.2 Measurement of Rainfall	
15.3 Measurement of Sunshine/Solar Radiation	
15.4 Measurement of Wind Direction	
15.5 Measurement of Relative Humidity	
15.6 Weather Forecasting and Synoptic Chart	
16. World Forestry, Indian Forestry, Forestry Education	423 – 482
16.1 Know the World Forest	
16.2 Indian Forest at a Glance	
16.3 Types of Forest in India	
16.4 Forestry Education	
16.5 Forestry As a Career Option	
16.6 Internship and Fellowship Programs in Forestry	
16.7 Forestry Research Journals	
16.8 Organization Structure of MOEFCC	
16.9 Know About Laboratory Equipment's	
16.10 Botanical Gardens in India	
16.11 Celebration of International Events/ Year	
16.12 Celebration of Important Days	
16.13 State animals, Birds, Flower and Trees	
16.14 Importance Forestry/Environment-Related Fact	
16.15 Glossary of Forestry	

