

Plant Analysis:

Comprehensive Methods and Protocols

B.K. Garg

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PREFACE

At the outset I wish to express my thanks to Shri Pawan Kumar M/s Scientific Publishers (India), Jodhpur for his inspiration and encouragement to write this book on laboratory techniques and analytical methods for plant analysis. His constant cooperation and generous help in arranging typing of this voluminous work in a short span of time made it possible to bring out the present publication in a record time of three months.

Analytical methods and protocols for diverse estimations in plants are a vital part of successful experimentation and execution of research projects in the field of Plant Physiology, Biochemistry, Molecular Biology and related plant sciences in Agriculture. There are numerous methods and techniques for analysis of plant nutrients, leaf metabolites, enzyme activities and other physiological and biochemical measurements. However, these are available in widely scattered sources like different journals, books, manuals and other forms. It is rather difficult for a student and researcher to lay his hands on all methods and techniques which demands lot of time and effort. The purpose of this book has been to compile all possible plant measurements at one place in a systematic manner for the optimum use of research workers and students.

The present book "Plant Analysis: Comprehensive Methods and Protocols" consists of 23 chapters covering different aspects of plant analytical techniques in a simple and easy manner. In chapter one guidelines for experimentation and plant analysis have been outlined. Chapter two deals with various methods of digestion of plant samples (including dry and wet digestion) for nutrient analysis. Chapter three discusses methods for determination of all major nutrient elements (N, P, K, Ca, Mg, S, Na and Micronutrients). Determination of leaf pigments (Chlorophylls and carotenoids) and chlorophyll fluorescence technique have been described in chapter four.

Chapter five deals with the estimation of organic molecules in plants, such as amino acids, proteins, nucleic acids, and other metabolites related to fatty acid metabolism. In chapter six, the concept of pH and acids and bases in plants has been introduced alongwith composition of all important buffers. Protocols for assay of various enzymes of nitrogen metabolism, ammonia assimilation,

reactive oxygen species (Chapter seven), photosynthetic enzymes and metabolites (Chapter nine) and other important plant enzymes (Chapter eight) have been elucidated alongwith relevant reaction equations. Similarly estimations of enzymes of infected plants and parasites (Chapter ten) and disease resistance related estimators have been described in a simplified manner in Chapter eleven.

The book also caters to the need of researchers in the field of plant water relations and stress physiology as measurement of growth indices and leaf area (Chapter twelve), stress indicators indices (Chapter fourteen), plant water status (Chapter fifteen) and aerenchyma (Chapter sixteen) have been thoroughly described. Measurement of photosynthetic and respiration rates in the field (using IRGA), transpiration (poromatus) and canopy temperature (infrared tele thermometer) have been vividly explained in chapter thirteen, which will be very useful for plant physiologists and Biochemists in their research work. Special topics like Electrophoresis (Chapter seventeen), Molecular Biology Techniques (Chapter eighteen), Determination of polyamines and phenolics by TLC/HPLC (Chapter nineteen) and Histochemistry of enzymes and metabolites (Chapter twenty) have also been dealt comprehensively. The process of symbiotic nitrogen fixation in legumes is very important for acquistation of atmospheric nitrogen in such plants. Various methods of N₂-fixation measurement and related estimations have been covered in chapter twenty two. Likewise, all important methods of root studies have been systematically presented in chapter twenty one. Assay and bioassays for plant hormones which are essential for plant growth and development have been given due place in the book (Chapter twenty three).

Thus, the present book is a complete account of all important techniques and methods for students and researchers in plant sciences and agriculture. I hope this compilation will be of immense use in various research laboratories devoted to Plant Physiology, Biochemistry and Molecular Biology Research. Suggestions and valuable comments are most welcome for further improvement of the present book.

Lastly, I wish to put on records my sincere thanks and regards to Dr. S.P. Vyas (Ex Principal Scientist) and Dr. Uday Burman (Principal Scientist, Plant Physiology) for their kind help and cooperation in compilation of this work. I am extremely grateful to my wife for her patience and constant encouragement during the writing of this manual.

B.K. Garg

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